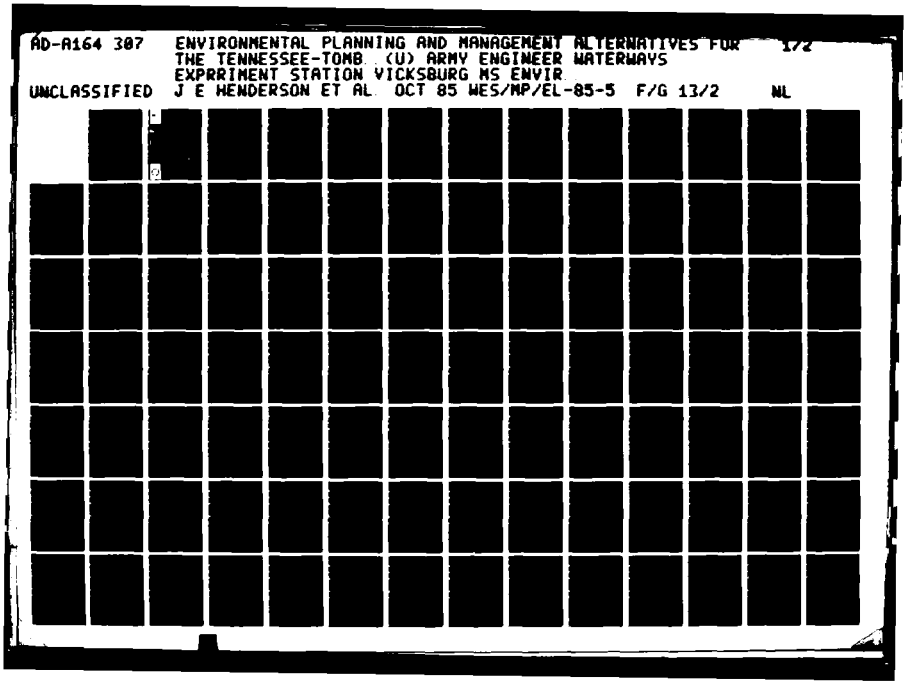
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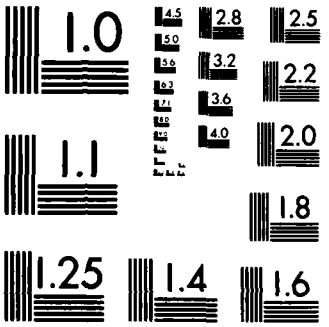

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TENNESSEE-TOMBIGBEE CORRIDOR STUDY

MISCELLANEOUS PAPER EL-85-5

ENVIRONMENTAL PLANNING AND MANAGEMENT ALTERNATIVES FOR THE TENNESSEE-TOMBIGBEE CORRIDOR

by

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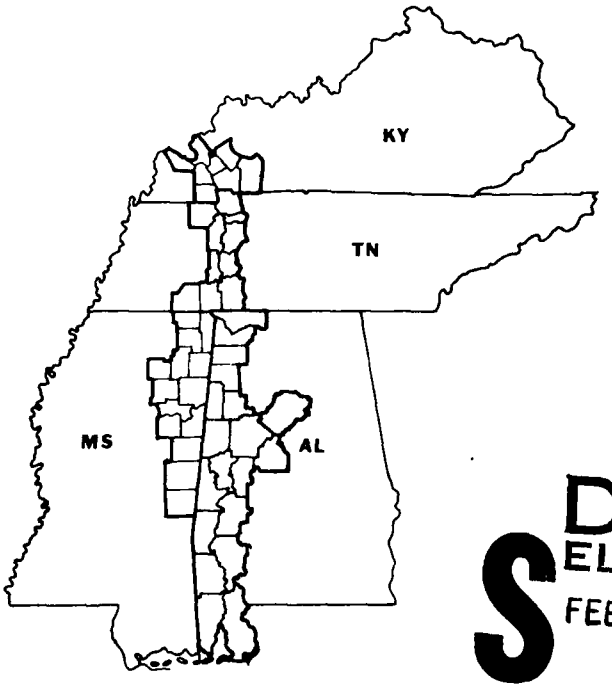

October 1985
Final Report

Prepared for US Army Engineer District, Nashville
Nashville, Tennessee 37202-1070

and US Army Engineer District, Mobile
Mobile, Alabama 36628-1001

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Tennessee-Tombigbee Corridor, the 51-county area affected by operation of the Tennessee-Tombigbee Waterway, has abundant and diverse environmental resources. These resources are affected to a lesser or greater degree by the operation of the waterway. Conservation, management, and/or development of these resources is primarily the responsibility of local and regional planners. This report, part of the Tennessee-Tombigbee Corridor Study, identifies planning and management alternatives for the environmental resources of the Corridor area that can be implemented by local and regional planners.

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The planning and management alternatives were developed for specific resource or resource protection categories. These categories include: floodplains, farmlands, wetlands, soil conservation, forest resources, water resources, ground water, cultural resources, urban and industrial lands, aquifer protection, recreation planning, and wildlife and wildland resources. The alternatives were developed by examining the following:

a. The data base of environmental resources developed by the Corridor Study.

b. Existing technical information and research available to the planner.

c. Legal and statutory basis for local planning and management for the resource.

d. Capability, in terms of manpower and finances, to implement potential alternatives.

In addition, for each State in the Corridor, the legal requirements relating to environmental resources are summarized. These reviews focus on permit and regulatory requirements for development or land use changes. For example, appropriate water quality, air quality, and hazardous waste standards are either included or referenced.

PREFACE

This report was prepared as part of the Tennessee-Tombigbee Corridor Study being conducted by the US Army Engineer Districts (USAED), Nashville and Mobile. Preparation of this report was sponsored by the USAED, Nashville, under Intra-Army Order 84-0035.

The work was performed during the period February to December 1984 by the Resource Analysis Group (RAG) and the Wetlands and Terrestrial Habitat Group (WTHG), Environmental Resources Division (ERD), Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES). The principal investigator on the study was Mr. Jim E. Henderson (RAG). This report was written by Mr. Henderson and Mr. James W. Teaford (WTHG). Part XII (Recreation Planning) was essentially written by Dr. Walter H. Bumgardner of the Department of Recreation, University of Southern Mississippi. At the time of the study, Dr. Bumgardner was working for the RAG on an Intergovernmental Act assignment agreement between WES and the University. The report was edited by Ms. Jessica S. Ruff of the WES Publications and Graphic Arts Division.

The work was conducted under the direct supervision of Mr. William J. Hansen, Chief, RAG, and Dr. Hanley K. Smith, Chief, WTHG, and under the general supervision of Dr. Conrad J. Kirby, Chief, ERD, and Dr. John Harrison, Chief, EL. Assistance in planning and performance of this study was provided by USAED, Nashville. Manager of the study for the USAED, Nashville, was Mr. James Sharber.

Commander of the USAED, Nashville, during the study was COL William T. Kirkpatrick, CE; Commander of the USAED, Mobile, was COL Patrick J. Kelly, CE. During the period of this study, COL Tilford C. Creel, CE, and COL Robert C. Lee, CE, were Commanders and Directors of WES and Mr. F. R. Brown was Technical Director. At the time of publication, COL Allen F. Grum, USA, was Director of WES and Dr. Robert W. Whalin was Technical Director.

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CONTENTS

ENVIRONMENTAL PLANNING AND MANAGEMENT ALTERNATIVES FOR THE TENNESSEE-TOMBIGBEE CORRIDOR

PART I: INTRODUCTION

Background

The Tennessee-Tombigbee Waterway, when placed into operation, will provide a link connecting the Ohio and Tennessee Rivers to the Port of Mobile on the Gulf of Mexico. This waterway improvement is expected to generate economic development along its entire route and beyond to include 51 counties designated as the Tennessee-Tombigbee Corridor. The Corridor has abundant and diverse environmental resources that are affected to a greater or lesser degree by development. Development within the Corridor should be planned and managed in such a way as to protect and enhance these environmental resources.

The Corridor Study inventoried the environmental resources of the Corridor. A series of Environmental Resource Inventories were prepared for the ten planning areas of the Corridor. The Inventories document the existing conditions for the natural resources in the Corridor. The Inventory information was used to develop the Integrated Data Analysis System (IDAS). IDAS used the Inventory information with some refinements to produce a computerized data base. This data base is accessible and provides baseline information for planning.

Purpose

The purpose of this report is to provide regional and local planners with some alternatives for environmental planning and management. The report is intended to identify the Inventory and IDAS information that is relevant to implementation of the various alternatives.

Scope

The environmental resources of the Corridor are diverse in type and vary between regions of the Corridor. The approach of this study was to examine categories of resources or environmental considerations, e.g., cultural

resources or ground water, and to identify the alternatives available to the planner. Because of the inherent differences between the resources, the alternatives presented differ in level of detail.

Organization and Use of This Study

Organization

The report is organized into two main sections. Parts II-XIII present planning and management alternatives for the various environmental resources. Part XIV summarizes the regulatory and legal requirements for environmental resources, organized by state.

Planning and management alternatives. Planning and management alternatives are presented for the major categories of environmental resources. Each part of the report presents basic technical information about characteristics of the resource in question and the impacts or changes related to development of the resource. The alternatives were developed by examining the following:

a. IDAS and Resource Inventory information.

b. Existing technical information and research available to the planner.

c. Legal and statutory basis for local planning and management for the resource.

d. Capability, in terms of manpower and finances, to implement potential alternatives.

Based on this information, alternatives were identified or developed that could be implemented by local or regional planners.

State summaries of regulatory requirements. For each state in the Corridor, the legal requirements relating to environmental resources are summarized. These reviews focus on permit and regulatory requirements for development or land use changes. For example, appropriate water quality, air quality, and hazardous waste standards are either included or referenced.

Use of this study

This study may be used to assist in planning for development or changes in the Corridor. The basic information about the resources and impacts and the available data can be used to identify potentially sensitive areas, e.g., wetlands, that should be accounted for in any planning effort. The regulatory information for the states can be used to support development efforts by identifying required permits and development constraints. The planning and management alternatives are used to formulate plans for management beyond development considerations.

PART II: FLOODPLAINS

Construction and operation of the Tennessee-Tombigbee Waterway required clearing and alteration of portions of the adjacent floodplains. Protection and management of these floodplains in an environmentally sound manner requires knowledge of the functions and characteristics of floodplains and a systematic approach to floodplain planning and management.

General Characteristics of Floodplains

Floodplains

A floodplain is the relatively flat or lowland area that adjoins a waterway and may be temporarily covered by floodwaters (Fairey 1975, US Department of the Interior (USDI) 1979).* There are three major types of floodplains: riverine, coastal, and special areas. Riverine floodplains parallel the channels of streams, rivers, or other watercourses, and flooding occurs when the capacity of the channel is exceeded by the volume of runoff. Coastal floodplains parallel the junction between land and water in coastal areas and are subject to flooding from landward flows created by exceptionally high tides, waves from very high winds, storm surges, or by a combination of these causes. Special floodplain areas refer to those areas subject to sheet-flow, shallowly flooded areas, wetlands, and sinkholes. An example of a special floodplain area would be the alluvial fans built up from geological debris carried by mountain streams and deposited when the stream encounters an abrupt decrease in slope (USDI 1979).

Floodplain functions. Floodplains perform varied ecological and hydrologic functions, including:

a. Ground-water recharge and discharge.
b. Flood storage.
c. Sediment trapping.
d. Nutrient retention and removal.
e. Food chain support.
f. Habitat for fisheries.
g. Habitat for wildlife.

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* Bibliographic citations are listed at the conclusion of each part of this report.

Refer to Adamus and Stockwell (1983) for a discussion of these functions for wetlands in general, in terms of definitions, interactions, validity, functional thresholds, and processes. The functions are modified by the activities of man.

Floodplain uses. Because of their location and characteristics, i.e., flatlands near watercourses, floodplains are used for a number of purposes. The more common land uses of floodplains are:

a. Water-based recreation.

b. Land-based recreation.

c. Production of agricultural crops.

d. Production of forest products.

e. Industrial and commercial development.

f. Residential development.

Floods and flood characteristics

A flood is a natural phenomenon in the hydrologic cycle that occurs when the channel cannot accommodate all of the water present. Water enters the channel from sources such as runoff, ice- and snow-melt, and tidal action (USDI 1979). The excess water spreads out onto the adjacent floodplain where it is essentially stored until the channel can again accommodate its volume. Some of the physical factors that influence flooding, and hence floodplain function, are the amount, intensity, duration, and distribution of rainfall; the condition of the ground and its vegetative cover as they influence infiltration rates and runoff; the size of the drainage basin; and the stream channel slope and extent of the floodplain. All of these factors are affected to a greater or lesser extent by the activities of man. Under normal conditions, an overbank flow occurs on a stream on the average of once every 1 to 2 years because the stream adjusts its channel to the amount of runoff from its basin or watershed. However, a flood of a given discharge will spread out to different stages or heights for different reaches on the floodplain as the water level adjusts to the local conditions.

In planning for floodplains, it is important to understand the flooding characteristics of the particular floodplain in question. Plans involving floodplains should incorporate information on the likelihood of flooding and the extent of flooding.

Likelihood of a flood occurring influences the use of a specific floodplain area. The probability of a flood of a certain size occurring in a given time, called the recurrence interval or flood frequency, may be used to determine whether or not development should be restricted in the floodplain. For instance, Federal floodplain insurance is based on the 100-year floodplain, i.e., a probability of 0.01 of a flood in the area or one in a hundred probability. Another indication of likeliness of flooding is seasonality or the seasonal occurrence of floods. Some areas exhibit a regular flooding pattern such that the greatest number of floods occur during one period of the year. Return period and seasonality are determined by historical flooding records (USDI 1979).

The extent of flooding is determined by the physical characteristics of the floodplain system and the volume of water in the flood. River stage is the height of the water level at a given point on the floodplain in relation to the height of the stream surface during periods of normal flow. Flood stage is generally designated as the river stage at a given point where the river first begins to significantly overflow its banks. The crest of a flood is the maximum river stage reached during that period; if the crest occurs at some height above flood stage, it is considered a flood crest. The duration of flooding, i.e., how long flooding occurs, is determined by a number of physical factors that determine how soon the channel can allow the flood crest to drain. The discharge, i.e., the size and magnitude of flow, occurring in a flood greatly affect the severity of the flood hazard. High-energy floods with high discharge rates are significantly more dangerous than low-energy floods (USDI 1979).

Floodplain Planning and Management

Floodplain planning and management is a systematic attempt to balance the use of floodplains with potential flooding losses, and an effort to preserve and protect various natural functions and values of the system (USDI 1979). The greatest impetus for systematic planning and management of floodplains came through the National Flood Insurance Act and amendments and Executive Order 11988 (24 May 1977) (Water Resources Council 1978) regarding floodplain management. The Act, administered by the Federal Emergency Management Agency (FEMA), provides for flood insurance for communities that implement

flood-proofing requirements and restrict development in the floodplain. From an environmental standpoint, participation in the flood insurance program is beneficial because the restrictions on development serve to preserve the floodplains in a natural condition, enhancing the ecological and hydrologic functions. Presently, most communities in the flood hazard areas designated by FEMA have completed plans for flood proofing and development restrictions. For communities participating in the flood insurance program, the planning information presented here may be redundant with plans developed for flood insurance eligibility.

In response to the executive order, the Water Resources Council issued implementing guidelines. Corps responsibilities were relegated to the Flood Plain Management Services Branch in the Office, Chief of Engineers, Washington, DC (Engineer Pamphlet 1105-2-15). This office administers the Floodplain Management Services Program (FPMS). FPMS activities include a range of technical services and planning guidance on floods and floodplain issues. These services can range from helping the community identify future flood and related conditions to assessment of planning measures that may be appropriate for the future (Engineer Pamphlet 1105-2-15).

Management and planning alternatives

The range of planning and management alternatives is constrained by the authority of State and local governments to regulate land use, zoning, and stream use. The range of measures for floodplain management includes: (a) development policies (e.g., agricultural versus urban development), (b) land use regulations (zoning ordinances, subdivision regulation, building and housing codes), and (c) flood control engineering measures (Weisz and Day 1974). Planning models developed for floodplain planning have been based on maximization of economic benefits alone, multiple-objective models (TRW Systems Group 1969), and models integrating hydraulic, economic, ecological, and social factors (James, Benke, and Ragsdale 1978).

Depending on the extent of planning authority, management can be assertive or reactive. When local planners have the authority to implement zoning and land use planning, environmentally oriented objectives may be pursued. When local land use authority is lacking, alternatives are more restrictive.

Overall planning for floodplain use includes development of objectives, alternatives, and evaluation of alternatives (TRW Systems Group 1969). It is beneficial to planners to receive input from the local community regarding

public preferences. Local planners may be interested in public opinion on such things as the desirability of floodplain development, preferences for alternatives, and the acceptability of land use controls (James, Benke, and Ragsdale 1978). This information can be attained from questionnaires and interviews with local individuals (Fredricks 1975).

The planning process

Floodplain planning involves five basic steps. First, an inventory of the physical and cultural features of the floodplain is compiled. Second, specific management objectives are developed. Third, a set of alternative plans are formulated. Fourth, alternative plans are evaluated. Fifth, plans are implemented.

Inventory. The first item in a floodplain management scheme should be to develop an inventory of the floodplains occurring in the region. Initially, all streams traversing the planning region should be delineated and the limits of their watersheds determined. A specific flooding frequency (e.g., the 100-year flood) is used for analysis. The IDAS can provide county maps showing the 100-year floodplain, as delineated by the flood hazard maps of FEMA. The FPMS can provide information on many floodplain areas. For areas not covered by IDAS or FPMS information, floodplain inventory maps can be developed. A number of alternative floodplain mapping techniques are presented in Table 1, and their relative advantages, disadvantages, and costs are discussed by Wolman (1971). The objective of mapping is to locate the floodplain resources of the region and to formally delineate those areas that are subject to a given probability of flooding, for later use in developing management alternatives.

After the floodplains of the region have been delineated, a number of factors should be considered. These factors are listed in Table 2 in the form of a checklist for use during the inventory stage. Communities and regional commissions may obtain much of this information by requesting assistance from various Federal agencies. The Catalog of Federal Domestic Assistance, available from the Government Printing Office, Washington, DC, provides information on the types of assistance available, the agency to contact, and other pertinent details.

For floodplains with highly valued environmental resources, e.g., wildlife habitat, it may be desirable to do an environmental inventory and

Table 1

Techniques of Mapping Areas Subject to Flooding

Methods	Principles	Principal Drawbacks	Approximate Cost
Physiographic	Correlation of flood levels with floodplain levels in area with terraced floodplains	Inadequate correlation of topographic form and flooding; omission of backwater effect	$1-$4/mile
Pedologic	Correlation with soil type, stratification, and drainage	Distinguishing alluvial and colluvial (slope wash) soils; similarities of terrace soils; indistinct association of soil and flooding	$1-$4/mile
Vegetation	Relationship between distinct vegetation assemblages and high water or flooding	Inconsistent or inadequate correlation of assemblages or species with floods, high water, or moisture	Unknown
Occasional flood	Air photos of flooding; historical record; recorded heights	Unavailable records; errors in transposition of boundaries	$200/quandrangle
Regional flood of selected frequency	Relation of heights of different frequency floods to hydraulic parameters of drainage area	Errors in transposition of boundaries; variation in hydraulic conditions; omission of backwater effect	$1.50-$4/mile
Flood profile and backwater curve	High-water marks or detailed hydraulic computations from flood records	Need of detailed topographic mapping; errors in estimating flood flow	$400-$1,000/mile

SOURCE: Wolman 1971.

Table 2

Inventory Factors to Consider in Floodplain Management Studies*

Factor	Measures
I. Physical Nature of the Floodplain -- a measure by which the physical nature of the floodplain can be evaluated by specific criteria to identify the existence and degree of effect of physical water and land actions in a given floodplain.	1. Flood history (frequency) 2. Identification of areas affected: a. Wide b. Narrow c. High-energy water 3. Duration 4. Availability of data
II. Present Use of Floodplain -- a measure of the degree to which the floodplain has developed in terms of economic and social activities.	1. Intensity of development 2. Types of development a. Housing b. Industry c. Recreation d. Undeveloped 3. Proportion of tax base 4. Economic importance
III. Proposed or Planned Use of Flood Plain (over next 10-20 years) -- a measure of the anticipated growth or decline in the use of floodplain lands from their present uses.	1. Changes from present uses; variety and degree of departure 2. Anticipated impact on economy of the community 3. Impact of proposed use on social concerns
IV. Environmental Impact -- a measure of the extent to which a floodplain management program will enhance or degrade the environment.	1. Enhancement of environment by protecting (or reverting to) natural conditions 2. Enhancement by creating new natural habitat where none exists

(Continued)

* Adapted from USDI 1979.

Table 2 (Concluded)

Factor	Measures
IV. Environmental Impact (Continued)	3. Degradation of the environment by developing or otherwise altering an area of the floodplain or adjacent areas that are in a natural state
	4. Extent to which one or more governmental entities will require a formal environmental impact statement
	5. Extent to which the floodplain management program is supported or opposed by one or more environmental groups
V. Existing Flood Protection Measures -- a measure of the extent to which flood protection measures modify the effect of the flood and the degree of protection afforded.	1. Existence of flood retarding structure for watershed; degree of protection
	2. Existence of local flood retarding or prevention measures in floodplain; degree of protection

evaluation. Figure 1 is an outline for conducting an environmental inventory of floodplains (adapted from James, Benke, and Ragsdale 1978).

The development of objectives and the formulation and evaluation of alternatives utilize the inventory information for decision making. Figure 2 presents a qualitative decision model for floodplains. This model is useful in visualizing how the various pieces of inventory information fit together. Table 3 summarizes sources of information for the decision model.

Objectives. An objective is the final result or outcome desired from some management action. The final results or outcomes desired should be specified as precisely as possible as objectives for the plan. When local planners have the authority to implement zoning and land use planning, environmentally oriented objectives may be pursued. Objectives may include development of park and recreational facilities, preservation of riparian wildlife habitat, and preservation of buffer zones from urban development. When local land use authority is lacking, alternatives are more restrictive and may include only state or locally administered programs, e.g. water quality permits. The initial objectives might be: (a) preventing loss of life from flooding events; (b) preventing severe property losses to individuals and businesses, and (c) preservation and enhancement of wildlife habitat in the floodplain (US Army Corps of Engineers (USACE) 1969).

These objectives can be as broad or as specific as the data availability allows. Local objectives relevant for planning floodplain management can be placed into three categories: (a) improving regional economic prosperity; (b) maintaining, restoring, or enhancing environmental quality; and (c) preventing flooding disasters (i.e., loss of life) and economic losses sustained by residential, business, and industrial interests. These objectives should express the needs of the regional community in the type and degree of floodplain land uses, as well as local and regional considerations. Different objectives may be necessary for different floodplains or for different reaches of the same floodplain.

Alternatives. Once objectives are set, an array of alternative plans are developed. These plans should cover the range of potential approaches or solutions that could be used in satisfying the objectives. For each combination of actions, the interrelated impacts and their associated advantages and disadvantages should be specified. Environmental, technical, and social constraints and benefits should be identified and the relative "costs" of each

I. CORRIDOR ANALYSIS
- A. TOTAL AREA
- B. EXTENT OF NATURAL VERSUS DEVELOPED AREAS
- C. EXISTING RIPARIAN (STREAMSIDE) VEGETATION
- D. SOCIAL WELFARE FACTORS
  1. ACCESSIBILITY
  2. VISUAL BUFFERING
  3. RECREATION

II. HABITAT ANALYSIS
- A. VEGETATION
  1. DIVERSITY — SIZE, TYPE, AND ABUNDANCE OF WOODY AND HERBACEOUS VEGETATION
  2. PERCENTAGE OF FLOODPLAIN COVERED, CLEARED LAND VERSUS NATURAL VEGETATION
  3. UNIQUE VEGETATION, E.G., UNUSUALLY LARGE TREES, DENSE GROWTHS

II. HABITAT ANALYSIS (CONTINUED)
- B. WILDLIFE AND FISH
  1. DIVERSITY — TYPE (BIRDS, SMALL MAMMALS, LARGE MAMMALS, ETC.) AND RELATIVE ABUNDANCE OF EACH TYPE
  2. PRESENCE OF RARE OR ENDANGERED SPECIES AND CRITICAL HABITAT
  3. SPECIAL OR UNIQUE HABITAT FOR THE REGION

III. DEGRADATION INDICATORS
- A. UNDESIRABLE PLANT SPECIES, E.G., POISON IVY, KUDZU
- B. FILL OR EXCAVATION AREAS

Figure 1. Environmental inventory for floodplains

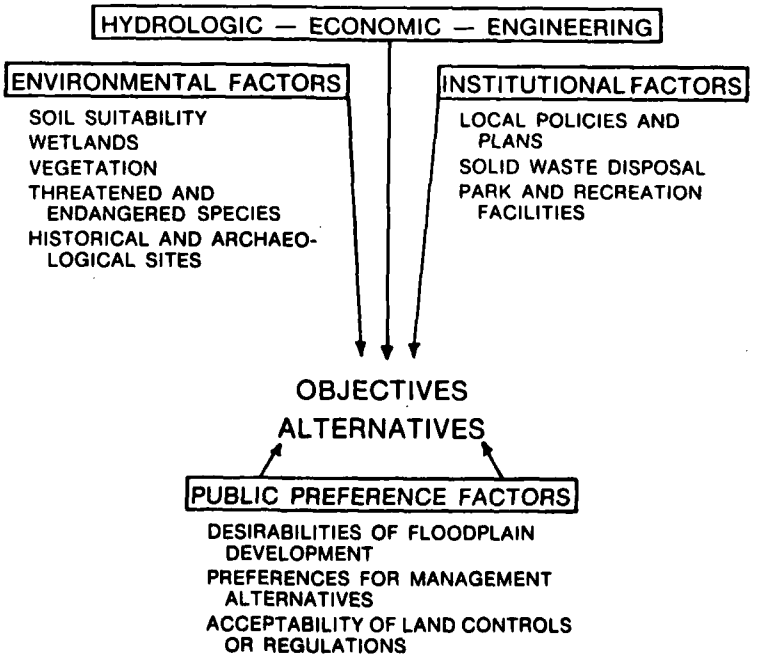


Figure 2. Decision framework for floodplains

Table 3

Sources of Information for the Decision Model

Factors to be Considered	Information Source
Environmental factors	
Soil suitability	Soil Conservation Service
Wetlands	Tenn-Tom wetland maps
Vegetation	Local or state surveys, sources
Threatened and endangered species	Tenn-Tom Endangered Species Report
Historical and archaeological sites	Inventories and cultural resources reports
Institutional factors	
Local policies and plans	Legal reports; local ordinances, plans
Solid waste disposal sites	Local sources
Park and recreation facilities	Tenn-Tom inventories, Statewide Comprehensive Outdoor Recreation Plans; local sources
Social or public preference factors	
Desirability of floodplain development	Judgments by local planners
Preferences for management alternatives	Public input through interviews, questionnaires, meetings
Acceptability of land controls or regulations	

determined. Alternative evaluation should consider local responsibilities for financing and implementation or enforcement.

Four broad floodplain management strategies should be considered in the development of alternatives. These strategies are to: (a) modify the flood; (b) modify the damage susceptibility, (c) modify the loss burden; and (d) do nothing. Modifying the flood implies flood protection development and/or watershed treatments. Modifying the damage susceptibility implies land use changes, flood-proofing activities, and planned development within the floodplain. Modifying the loss burden is accomplished by flood insurance programs, tax write-offs, disaster relief programs, and emergency measures during and after flooding. Doing nothing implies letting the present courses of floodplain development and flooding events continue unchanged (USDI 1979).

Given these broad strategies, three different types of floodplain management alternatives are formulated: (a) structural alternatives, (b) nonstructural alternatives, and (c) developments outside the floodplain. Structural alternatives include the construction projects traditionally associated with flood control work such as dams and reservoirs, levees and floodwalls, and channel improvements. Nonstructural alternatives include such activities as flood warning and evacuation systems, floodplain regulation, flood insurance, and the flood proofing of structures on the floodplain. Nonfloodplain measures include those activities that occur or are sited outside the floodplain, e.g., considering industrial development sites on upland areas rather than in similar sites within the floodplain. For developments outside the floodplain, generally only those alternatives that are reasonable substitutes for flood-oriented programs are considered (USACE 1969).

The formulation of alternative plans consists in part of a process of examining the objectives and strategies to determine which strategies will meet the objectives, given the institutional, environmental, and public preference factors in addition to local implementation and financing constraints (USACE 1969).

Evaluation. After the potential alternatives are identified, they are evaluated to determine a set of alternatives to be used in the final decision process. Potential alternatives are compared with the information developed in the inventory stage to determine a set of "feasible" alternatives, i.e., feasible in terms of the particular physical environment. These feasible alternatives are then evaluated in light of: (a) the costs and financing of

each, (b) the institutional constraints faced by each, (c) the public preference of the region, (d) the need to preserve present and future management flexibility (i.e., try to avoid irreversible decisions), and (e) the compatibility of the various alternatives. Feasible alternatives that pass these hurdles then become viable alternatives (USACE 1970).

Once viable alternatives are identified, a performance matrix should be developed where the rows are the various alternative plans and the columns are the various management objectives. Each plan is then evaluated with regard to each objective, and a performance rating is assigned to each block of the matrix. Those plans that are inferior to another plan with respect to each objective are considered "dominated" and are deleted from further consideration. The remaining plans represent the best plans that should be used in the final selection process (USACE 1969).

Decision process. The task of choosing the best plan requires the introduction of value judgments into the planning process. The decision maker or decision-making body must determine the relative worth of achieving each different management objective. Local decision makers can make these value judgments or can rely on input from the public (USACE 1969).

Implementation. As stated earlier, implementation should be considered in plan formulation. Some mechanism should be developed to monitor implementation of the selected plan.

References

Adamus, P. R., and Stockwell, L. T. 1983. "A Method for Wetland Functional Assessment; Volume I. Critical Review and Evaluation Concepts," Federal Highway Administration Report No. FHWA-IP-82-23.

Fairey, D. A. 1975. "Flood Plain Management in South Carolina," South Carolina Land Resources Conservation Commission,

Fredricks, Paul C. 1975. "Test of Flood Plain Management Planning Methodology at Pullman, Washington," IWR Pamphlet No. 2, US Army Engineer District, Walla Walla, Walla Walla, Washington (prepared for US Army Engineer Institute for Water Resources, Fort Belvoir, Va.).

James, L. Douglas, Benke, Arthur C., and Ragsdale, Harvey L. 1978. "Integrating Ecological and Social Considerations into Urban Flood Control Programs," Water Resources Research, Vol 14, No. 2, pp 177-184.

Office, Chief of Engineers. 1982. Engineer Pamphlet 1105-2-15, Chapter 2, "Flood Plain Management Services (FPMS) Program," Washington, DC.

TRW Systems Group. 1969. "A Methodology for Flood Plain Development and Management," IWR Report 69-3, US Army Engineer Institute for Water Resources, Fort Belvoir, Va.

US Army Corps of Engineers. 1969. "A Methodology for Flood Plain Development and Management," Institute for Water Resources Report 69-3, Fort Belvoir, Va.

_____. 1970. "Community Goals-Management Opportunities: An Approach to Flood Plain Management," Institute for Water Resources Report 70-2, Fort Belvoir, Va.

US Department of the Interior. 1979. "A Process for Community Flood Plain Management," Office of Water Research and Technology Planning Manual TT/79-9.

Water Resources Council. 1978. Flood Plain Management Guidelines for Implementing Executive Order 11988, Federal Register, 10 Feb 1978.

Weisz, Reuben N., and Day, John C. 1974. "A Methodology for Planning Land Use and Engineering Alternatives for Flood Plain Management: The Flood Plain Management System Model," IWR Paper 74-P2, University of Arizona, Tuscon, Ariz. (prepared for US Army Engineer Institute for Water Resources, Fort Belvoir, Va.).

Wolman, M. G. 1971. "Evaluating Alternative Techniques of Floodplain Mapping," Water Resources Research, Vol 7, No. 6, pp 1384-1387.

PART III: FARMLANDS

Introduction

Between 1967 and 1975 approximately 23 million acres of agricultural lands in the United States were converted to nonagricultural uses; approximately one-third of the nearly 3 million acres converted each year were classified as prime farmlands (Duncan 1984). These farmlands are being lost to urban expansion, highways, airports, lakes and reservoirs, and rural homesteaders (Berg 1981). At the same time, demand for agricultural production continues to increase.

It has been estimated that over the next 20 years the demand for US agricultural products will increase 60 to 85 percent over 1980 demand levels. Past demand increases have been met by a combination of increased productivity per acre farmed and an increase in the number of acres farmed. Productivity increases are still envisioned for the future, but probably not at the high rates experienced in the past. The reliance on bringing new lands under production is questionable as well, because these new "potential" croplands are increasingly of inferior agricultural value, i.e., less productive lands subject to greater erosion hazards, and the costs of bringing them into production are greater (Berg 1981, Duncan 1984). Although the United States has an agricultural land base (crops and pasture) of approximately 540 million acres and is in no immediate danger of losing that base, the problem of farmland loss is quite serious (Duncan 1984).

The outlook for the future shows the need for more complete utilization of the agricultural land base accompanied by a diminishing rate of conversion of farmlands to nonfarm uses. The increased use of the agricultural land base must come from: (a) lands now used for pasture and hay production and (b) "potential croplands." Only about 10 percent of the lands classified as potential croplands are high-quality land capable of supporting high-yield production with minimal land preparation and erosion hazards. The remaining "potential croplands" are of moderate to low value, and their use for row crop agriculture will present similar high-erosion hazards that accompany the conversion of pasturelands into row crops (Duncan 1984). Berg (1981), for example, cites erosion rates for 21 west Tennessee counties as 30 to 40 tons/acre/year (with some unprotected farms losing as much as 150 tons/acre/year) on

former pasturelands converted to row cropping for soybeans. A maximum erosion rate of 5 tons/acre/year is considered acceptable and can be replenished through natural processes and good management.

Apparently the only real long-term solution to this problem is to somehow diminish the rate of loss of farmlands, especially prime farmlands, to nonfarm use. A cessation of urban and rural growth is impractical, but the impacts must be somehow diverted to less valuable lands.

Prime farmland has been defined as that land having "the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods" (7 CFR Sect. 657.5(a)). In other words, prime farmland is "level, well drained land that produces the highest crop yields with the least damage to the soil" (Berg 1981).

Planning and Management Alternatives

It is assumed that the preservation of farmlands, especially prime farmlands, will be the main goal of farmland management on a regional basis in the Tennessee-Tombigbee Corridor. The IDAS has digitized information processed from LANDSAT data that can be used to identify and display agricultural and pasturelands for regional overviews and decision making. The alternatives that follow are based on an in-depth analysis by Duncan (1984); regional planning agencies are referred to this study for a detailed discussion of the problems associated with preserving farmlands. It should be noted that the resolution of the farmland preservation problem cannot proceed in a vacuum, and the other resources addressed in the present volume must be fully considered. At some point, all of the resources of the region must be considered in a holistic manner.

Preferential taxation

Preferential taxation programs are based on granting tax relief to farmers through favorable ad valorem tax assessments for agricultural land. Farmlands are either assessed at a lower value (i.e., current use value rather

than fair market or highest and best use value) or taxed at a lower rate. Four basic types of tax relief programs exist under this general category: (a) pure differential assessment, (b) deferred taxation, (c) restrictive agreements, and (d) zoning or planning programs.

Under pure differential assessment, tax relief is granted solely on the basis of owning farmland. There are no requirements to pay back tax savings if the landowner elects to convert his land to another use, and the value of this system depends on the simple tax relief as an incentive for the landowner to maintain his land as agricultural land.

Deferred taxation programs assess taxes on the basis of current land use as long as the land remains in that land use. If the land is converted to another land use, the landowner is required to pay the difference in tax rates between the former and present uses for some specified period of time (commonly ranging from 2 to 10 years).

Programs using restrictive agreements require the landowner to enter into a contract (often with a 10-year minimum life and automatically renewed unless specifically cancelled) to maintain his land as farmland in order to qualify for a differential tax break. These contracts are binding and cannot be cancelled by the landowner without showing that cancellation is in the public interest; even then, cancellation normally requires a repayment of the tax benefits previously granted and the payment of a cancellation fee.

Mandatory zoning and planning programs are similar to restrictive agreement programs except that the county must develop a zoning plan or preservation plan in order for a landowner to be eligible to participate in the program. A particular tract of land must be zoned for agriculture before it qualifies for tax relief, and tax credits are available only as long as the land remains in that use. Repayment penalties are assessed if the land use changes.

Evaluation of these various types of programs has shown they are effective "in general" but often fail at the "urban fringe" where developmental pressures are greatest. As the probability of development increases, fewer landowners elect to participate in these programs (Duncan 1984).

Agricultural districting

Under this type of program, farmers receive protection from governmental action in exchange for enrolling their land in an agricultural district. A farmer or group of farmers with a predetermined amount of land (e.g.,

500 acres in New York) may petition their county for the creation of an agricultural district on their lands. Agricultural district lands are granted use value tax assessments and are protected from development pressures in three basic ways. First, the farmlands are exempted from most ad valorem tax assessments for such things as sewer, water, lighting, nonfarm drainage, and solid waste disposal. Second, any nonfarm construction proposed for agricultural district lands and financed by a State government agency must be examined by State agricultural authorities. Third, the use of eminent domain is severely limited in such areas. One of the primary advantages of such a system is to force local governing bodies to evaluate the effects of their proposed actions and hence to direct growth away from agricultural areas.

Agricultural zoning

Agricultural zoning implies the same concept as urban zoning except that the minimum unit or parcel size is larger. There are two basic types of agricultural zoning: (a) nonexclusive measures that permit nonagricultural development subject to certain restrictions, and (b) exclusive zoning which bars most nonagricultural uses.

Nonexclusive zoning generally encompasses four basic approaches:

a. Large minimum lot size.

b. Fixed area combined with small building lot size.

c. Sliding scale combined with small building lot size.

d. Conditional use approval.

Large minimum lots permit nonfarm development on lot sizes generally corresponding to the typical size of farms in the area (10 to 640 acres). With the fixed area concept, a landowner is allowed to develop one lot for each land unit of a given size (e.g., one lot per 40 acres). Under a sliding scale system, the landowner can develop fewer lots as the size of the tract increases (e.g., one lot on a 5-acre tract, but only four lots on a 30- to 60-acre tract). Conditional zoning systems permit only those nonfarm uses meeting specified criteria, and each proposed development must be evaluated separately.

Exclusive agricultural zoning prohibits nonfarm development. Under this type of system, the construction of a nonfarm building requires a zoning change.

According to Duncan (1984), zoning will probably be ineffective in halting the conversion of farmland to nonfarm uses, especially at the urban fringe

where the pressure is greatest. Under nonexclusive zoning, Duncan says that farmlands will be divided into large tracts as a matter of right, i.e., the land can be converted without any zoning use change. With exclusive zoning, the land is still subject to zoning changes if the zoning authorities determine the change is acceptable and desirable.

Purchase of development rights

Development rights programs purchase the right to develop a tract of land for nonagricultural uses (Duncan 1984). The purchase is permanent, and these rights are generally purchased by a local governmental body. The landowner is paid a fee for his inherent right to develop his farmlands for nonfarm uses, but the landowner still retains all other aspects of ownership. The landowner is responsible for property taxes, but only at an agricultural usage rate. The farmer may continue to farm or he may sell his land (at agricultural land prices) to another farmer for continued agricultural use.

Conceptually, this program will protect agricultural lands in perpetuity. The program can be expensive and may be a measure of last resort for lands in the urban fringe. However, on a willing seller basis, this type of approach may have great merit in rural areas, especially in times of economic hardship.

Transfer of development rights

This program is similar to the preceding one except that the nonfarm development rights are purchased by developers in the open market, rather than by governmental bodies. This system implies a high degree of land use control in the area already, as there must be a demand for development rights in designated receiving zones where such rights would be used. For example, a farmland owner in an agricultural zone could sell, at market rates, the development rights of his property to a real estate developer who would transfer those rights to a given tract of land in another zone. The developer would thereby be allowed to install a more intensive development than normal and hence receive a larger return on his initial property investment. The system depends on the designation of agricultural reserves, or sending zones, where development is restricted, and on receiving zones where development is allowed. The system protects the integrity of the agricultural land and allows the farmer to receive just compensation for his inability to convert his lands to other uses.

References

Berg, N. A. 1981. "USDA Goals for Strengthening Private Land Management in the 1980s," Transactions of the North American Wildlife and Natural Resources Conference, Vol 46, pp 137-145.

Duncan, M. L. 1984. "Toward a Theory of Broad-Based Planning for the Preservation of Agricultural Land," Natural Resources Journal, Vol 24, pp 61-135.

PART IV: WETLANDS

Introduction

Although most citizens can recognize "wetlands" as a general concept (i.e., marshes and swamps), the details of the issue are only recently becoming widely appreciated, even within the technical community. Because the issue is important and dynamic, the planners and the public should be aware of the definitions, historical trends, current status, and constraints that impact the use of wetlands. With this information and with some general comments on a planning framework as an overview, various planning and management alternatives are presented for consideration.

Definition

On 24 May 1977, President Carter issued Executive Order 11990, "Protection of Wetlands," which defined wetlands from the Federal policy standpoint as "areas that are inundated by surface or ground water, with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction." Cowardin et al. (1979) presented a classification system for wetlands based on the technical concept that wetlands

> ...are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes [plants typically found in wet habits]; (2) the substrate is predominantly undrained hydric soil [soil that is wet long enough to periodically become deficient in oxygen, thereby influencing the growth of plants]; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

In general terms, wetland types to be expected in the Tennessee-Tombigbee Corridor would be inland freshwater marshes, shrub swamps, wooded swamps, bottomlands, and coastal salt marshes.

Historical trends

Approximately 30 to 50 percent of the original wetlands in the lower 48 states has been converted to other uses such as agriculture, mining, forestry, oil and gas exploration, and urbanization. Between the mid-1950s and the

mid-1970s, approximately 11 million acres of wetlands in the lower 48 states were converted to these other uses. Ninety-seven percent of these losses during this 20-year period occurred in inland, freshwater wetlands. Eighty percent of these inland losses resulted from conversions to agricultural uses (drainage, clearing, land leveling, ground-water pumping, and surface water diversions); 8 percent resulted from the construction of impoundments and large reservoirs; 6 percent from urbanization; and 6 percent from other causes (mining, forestry, road construction, etc.). Approximately 56 percent of the actual losses of coastal wetlands resulted from dredging for marinas, canals, and port development; 22 percent resulted from urbanization; 14 percent was due to dredged-material disposal or beach creation; 6 percent from natural or man-induced transition from saltwater to freshwater wetlands; and 2 percent from agriculture (Office of Technology Assessment (OTA) 1984).

Current status

In the mid-1970s, approximately 99 million acres of vegetated and unvegetated wetlands existed in the United States (not including Alaska and Hawaii). Of these remaining wetlands, approximately 95 percent are inland wetlands, while 5 percent are saltwater or coastal wetlands. Coastal wetlands are reasonably well protected through a combination of Federal and State regulatory programs, but the inland freshwater wetlands generally are not well protected (OTA 1984).

National and regional data and trends on wetland preservation and use are presented by the OTA (1984); regional wetland information for the Tennessee-Tombigbee Corridor is presented in the IDAS, developed specifically for the Corridor.

Constraints

Federal restrictions that act as constraints to State, local, and private interests in the alteration and irreversible conversion of wetlands to other uses are based primarily on: (a) Section 10 of the Rivers and Harbors Act of 1899; (b) Section 404 of the Clean Water Act of 1977, (c) the Coastal Zone Management Act of 1972, and (d) Executive Order 11990 (May 1977). A general overview of these programs is presented below. Current specific permit information can be obtained from Engineer Pamphlet 1145-2-1, "Permit Program, A Guide for Applicants" (Office, Chief of Engineers, Washington,

DC 20314), and from the District Engineer of the USAE District, Mobile or Nashville.

Section 10 of the Rivers and Harbors Act

Any work that "will alter or modify the course, condition or capacity of navigable waters" must be authorized by the USACE. Permits are required for dredging, filling, or other activities that could obstruct "navigable waters" (waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce) (33 CFR Part 323.2(b); Federal Regulation 47:31811, 22 July 1982). Criteria used in evaluating these permit requests include: conservation, economics, aesthetics, environmental concerns, fish and wildlife values, flood damage prevention, welfare of the general public, historic values, recreation, land use, water supply, water quality, navigation, energy needs, safety, and food production.

Section 404 of the Clean Water Act

A Section 404 permit is required from the Corps if work is planned to locate a structure, excavate, or discharge dredged or fill materials in waters of the United States, or transport dredged materials for the purpose of dumping it in ocean waters. "Waters of the United States" have been defined broadly by the USACE (33 CFR Part 323.2(a); Federal Regulation 47:31810-31811, 22 July 1982) as:

(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(2) All interstate waters including interstate wetlands;

(3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:

(i) Which are or could be used by interstate or foreign travels for recreational or other purposes; or

(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(iii) Which are used or could be used for industrial purposes by industries in interstate commerce;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition.

(5) Tributaries of waters identified in paragraphs (a) (1)-(4) of this section;

(6) The territorial sea;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1)-(6) of this section. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition), are not waters of the United States.

In addition to the specific criteria used in evaluating Section 10 permit applications, the Corps also uses three general criteria to evaluate Section 404 permit applications in a "public interest review": (a) the relative extent of the public and private need for the proposed structure or work, (b) the desirability of using appropriate alternative locations and methods to accomplish the objective of the proposed structure or work, and (c) the extent and permanence of the beneficial or detrimental effects that the proposed structure or work may have on the public and private uses to which the area is suited.

Certain activities were specifically exempted by the 1977 Clean Water Act from the Section 404 permit process (OTA 1984). These exemptions are:

a. Normal farming, silviculture, and ranching activities, such as plowing, seeding, and cultivating; minor drainage; harvesting for the production of food fiber and forest products; or upland soil- and water-conservation practices.

b. Maintenance, including emergency reconstruction of recently damaged parts of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures.

c. Construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance of drainage ditches.

d. Construction of temporary sedimentation basins on a construction site, but excluding placement of fill material into navigable waters.

e. Construction or maintenance of farm or forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained in accordance with best management practices to ensure that flow and circulation patterns and chemical and biological characteristics of the navigable waters are not impaired, that the reach of the navigable waters is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized.

f. Congressionally approved projects that have filed an Environmental Impact Statement (EIS).

Coastal Zone Management Act

The Office of Coastal Zone Management (OCZM), National Oceanic and Atmospheric Administration, US Department of Commerce, sets guidelines and provides funding to States to prepare and implement their respective Coastal Zone Management programs. For approved programs, the OCZM provides funds to enable the State to hire personnel for implementing, monitoring, and enforcing their program, to include the consideration of impacts on coastal wetlands. The OCZM annually reviews the States' programs to ensure, among other things, that important wetland values are preserved.

Executive Order 11990

This Order directs Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. This order specifically requires that agencies avoid undertaking or assisting new construction in wetlands unless no practicable alternative exists, that all practical measures to minimize harm to wetlands are included in the action, and that agencies consider a proposal's effect on the survival and quality of wetlands (OTA 1984).

Information Sources

Information of interest concerning wetlands can be placed into four general categories: (a) identification and classification of wetlands, (b) delineation of wetlands, (c) functions and values of wetlands, and (d) management and regulation of wetlands. Selected references for each of these categories are listed below.

Cowardin et al. (1979) provide a detailed classification of wetlands and deepwater habitats of the United States. Huffman et al. (1982) and the Environmental Laboratory (1982) provide guidance for the onsite identification and delineation of wetlands for the South Atlantic and Interior portions of the United States, respectively. The Wetlands Research Program of the Environmental Laboratory, US Army Engineer Waterways Experiment Station (WES), is developing a Wetlands Delineation Manual; Dr. Hanley K. Smith, Wetlands Program Manager, is the point of contact for this work.

Wetlands functions and values were the subject of a national symposium

sponsored by the American Water Resources Association (Greeson, Clark, and Clark 1978). Lonard et al. (1981) reported on an analysis of methodologies used to assess wetland values. Adamus and Stockwell (1983) developed a method for wetland functional assessment for the Federal Highway Administration. Smardon (1983) discussed the visual-cultural values of wetlands in the United States. The Wetlands Research Program at the WES also has a current work unit on the evaluation of wetlands.

Larson (1975) reported the development of evaluation models for public management of freshwater wetlands in Massachusetts. Johnson and McCormick (1978) reported the proceedings of a national symposium on the strategies for protection and management of floodplain wetlands. The OTA (1984) has summarized past trends and future options for the use and regulation of wetlands.

Planning and Management Alternatives

Three basic options exist in wetlands management: (a) preservation of the system in its natural state, (b) partial alteration of the system, and (c) conversion to a different land type (Larson 1975). Prior to 1970, the decision to exercise one of these options for a given wetland rested primarily with the individual landowner. With the enactment of the Coastal Zone Management Act of 1972 and the Federal Water Pollution Control Act of 1972 (as amended in 1977 as the Clean Water Act), the Federal Government imposed restrictions on the landowner in order to ensure that benefits to the general public would also be considered when these decisions are made. However, restrictions do not imply management, and the ultimate land use decisions remain with the landowner, within the guidelines imposed by society.

The planning and management alternatives developed below are based on the assumption that the regional planning agency will attempt to mediate between the needs of society as a whole and the needs of public entities and individual landowners within its jurisdiction. These alternatives will emphasize advisory, assistance, and regulatory activities appropriate to a planning agency's function; specific land management recommendations will not be presented in detail.

Inventory and classification

Data from the National Wetlands Inventory maps developed by the US Fish and Wildlife Service and digitized as inputs to the IDAS developed for the

Tennessee-Tombigbee Corridor should serve as the basis for a comprehensive wetlands inventory for the planning region. Field surveys should be conducted to verify the map data and to perform an initial evaluation of each wetland identified. Individual wetlands should be examined against predetermined criteria to identify sites that qualify as "outstanding" wetlands (i.e., those wetlands worthy of preservation in their natural state) (Larson 1975). Significant features of those wetlands not accorded the "outstanding" classification should be recorded and filed as background material to be used in future land use decisions.

Larson (1975) suggested that the following criteria should be useful in identifying "outstanding" wetlands worthy of preservation:

a. Rare, restricted, endemic or relict flora or fauna.

b. Flora of unusually high visual quality and infrequent occurrence.

c. Flora or fauna at, or very near, the limits of their range.

d. Juxtaposition, in sequence, of several seral stages of hydrarch succession (i.e., a situation where several different stages of wetland succession adjoin or are in close proximity to one another).

e. High production of native water, marsh, or shorebird species.

f. Use by great numbers of migratory water, marsh, and shorebirds.

g. Outstanding or uncommon geomorphological features.

h. An established record of scientific research on the site.

i. Known presence of archeological evidence.

j. Wetlands which are integral links in a system of waterways, or whose size dominates a regional watershed.

Information and education

The regional planning agency should exert strong leadership in the compilation and dissemination of information concerning the functions and values of the different types of regional wetlands. Programs (presentations, pamphlets, etc.) should be developed to educate the general public and individual landowners as to their collective and individual stake in maintaining a healthy system of regional wetlands.

Taxation

The planning agency should work to develop and advocate the adoption of a property taxation assessment schedule that would encourage private landowners to maintain wetlands on their property. Often the assessment rates for wetlands that are "unproductive" for the landowner are the same as those for other more productive land types (e.g., agricultural), and the regular tax

burden becomes an incentive to the landowner to "reclaim" wetlands for financial gains. The interests of the landowner and those of society are often at odds, and any efforts to impose society's values on individual landowners may be resisted if society does not assume some of the financial burden. An equitable tax assessment structure can thus be a mechanism whereby society pays its share of the costs of wetlands preservation on private lands.

In 1979, Minnesota enacted a tax exemption and credit program whereby a landowner can agree yearly to preserve his wetlands in their natural state and be exempted from the local property taxes normally due on those wetland acres. This law also provides a tax credit of three-fourths of 1 percent of the value of an acre of cropland in the township in which the preserved wetlands occur. The sum of the exemptions and credits is deducted from the landowner's local net property taxes due. The State, in turn, reimburses the county for the revenues "lost" at the local level. Thus, the State of Minnesota has devised a method that allows the general public to share with the landowner in paying the costs of wetlands preservation (Peterson and Madsen 1981).

Purchase and management of wetlands

The planning agency should explore the possibility of purchasing easements and/or title to significant wetlands within its region. The planning agency could sponsor the formation of a broad-based public committee designed to implement a land purchase program. This citizen committee could determine the region's needs and set program objectives. Using the information developed in the inventory and classification of regional wetlands, the committee could set priorities for the acquisition of wetlands and wetland easements on a willing seller-willing buyer basis. This committee and the regional planning agency could also act as the intermediary agent between a local willing seller and a national buyer for more costly wetland tracts, much as the Nature Conservancy now operates.

Assistance

The planning agency should explore the opportunities to provide assistance to local wetland owners. This assistance could range from the identification and delineation of wetland boundaries, to help in initiating and processing Section 10 and Section 404 permits, to advice concerning the management of wetlands for financial returns (e.g., hunting). An active assistance program could help develop a productive dialogue and good relations between wetland owners and those responsible to represent the general public's

interests in wetland issues. Anticipated benefits from this program could range from enthusiastic avoidance of or mitigation for adverse impacts from planned, controlled development, to cooperative management efforts between owners and the planning agency, to possible donation of wetland acres for public ownership and preservation.

Regulation

After regional objectives and priorities have been set and optional compliance through favorable taxation and assistance programs have been attempted, the planning agency may have to explore the possibility of enforced compliance through a regulatory program. The goals and objectives of this program should be well thought out, and the program should be designed to accomplish those objectives as effectively as possible. A land use planning or zoning approach to the preservation and management of regional resources may be necessary to ensure that the legitimate needs of society are adequately protected.

Cooperation between planning regions

Wetland values are system values that transcend the local arena. To be effective, wetland programs must cross political boundaries, and this implies cooperation between regions. Goals, objectives, and cooperative agreements must be developed at the Corridor, State, regional, and local levels, and good faith implementation of these programs by all parties is vital to the overall success of the program.

Legislative remedies

It is quite likely that many aspects of the planning alternatives discussed above are not presently legally authorized. Specific taxation and regulatory authorities and compact agreements between States and regions may be needed. These needs should be determined, articulated, and presented to the general public and to the various State (or Federal) legislatures for satisfactory remedies. It is particularly important that the various regional planning units in the Tennessee-Tombigbee Corridor cooperate among themselves and take an active leadership role in developing the necessary legal basis for effective, comprehensive planning and management in the area.

References

Adamus, P. R., and Stockwell, L. T. 1983. "A Method for Wetland Functional Assessment; Vols I and II," US Department of Transportation, Federal Highway Administration Report Nos. FHWA-IP 82-23 and 82-24.

Cowardin, L. M., Carter, V., Golet, F. C., and LaRoe, E. T. 1979. "Classification of Wetlands and Deepwater Habitats of the United States," FWS/OBS-79/31, US Fish and Wildlife Service, Washington, DC.

Environmental Laboratory. 1982. "Preliminary Guide to the Onsite Identification and Delineation of the Wetlands of the Interior United States," Technical Report Y-78-6, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Greeson, P. E., Clark, J. R., and Clark, J. E., eds. 1979. "Wetland Functions and Values: The State of Our Understanding," American Water Resources Association, Minneapolis, Minn.

Huffman, R. T., Tucker, G. E., Wooten, J. W., Klimas, C. V., Freel, M. W., Forsythe, S. W., and Wilson, J. S. 1982. "Preliminary Guide to the Onsite Identification and Delineation of the Wetlands of the South Atlantic United States," Technical Report Y-78-7, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Johnson, R. R., and McCormick, J. F., Tech. Coords. 1978. "Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems," Proceedings of a Symposium, December 11-13, 1978, Callaway Gardens, Ga., General Technical Report WO-12, US Department of Agriculture, Forest Service, Washington, DC.

Larson, J. S. 1975. "Evaluation Models for Public Management of Freshwater Wetlands," Transactions of the North American Wildlife and Natural Resources Conference, Vol 40, pp 220-228.

Lonard, R. I., Clairain, E. J., Jr., Huffman, R. T., Hardy, J. W., Brown, L. D., Ballard, P. E., and Watts, J. W. 1981. "Analysis of Methodologies Used for the Assessment of Wetlands Values," US Water Resources Council, Washington, DC.

Office of Technology Assessment. 1984. "Wetlands: Their Use and Regulation," US Congress Report OTA-0-206.

Peterson, C. C., and Madsen, C. R. 1981. "Property Tax Credits to Preserve Wetlands and Native Prairie," Transactions of the North American Wildlife and Natural Resources Conference, Vol 46, pp 125-129.

Smardon, R. C. 1983. The Future of Wetlands: Assessing Visual-Cultural Values, Allanheld and Osmun, New Jersey.

PART V: SOIL CONSERVATION

Introduction

Soil conservation is important for two reasons. First, it is important to protect our agricultural and forestry land base from erosion that could limit or destroy the productive capability of the soil. Second, soil erosion produces sediment which has become a major pollutant of our waterways (Grant 1972).

A soil erosion rate of 5 tons of soil/acre/year is considered the maximum "acceptable" loss as this is the amount that can be replaced through natural soil-building processes each year. Rates above this "acceptable" level deplete the topsoil layer; if corrective action is not implemented in time, the topsoil layer will be lost. This loss is essentially a permanent loss to the Nation in a historical perspective, as the agricultural productivity of the soil cannot be reconstituted in our lifetime (Berg 1981).

Sedimentation rates resulting from soil erosion should also be of immediate concern to the people of the Tennessee-Tombigbee Corridor. High sedimentation rates will directly affect the amount and extent of shoaling that occurs in the Tennessee-Tombigbee Waterway. Increased shoaling will: (a) restrict navigation, (b) require more dredging and hence higher maintenance costs for the Waterway, and (c) require more dredged material containment areas, which implies a public need versus private ownership conflict.

Planning and Management Alternatives

Classification of soils

An inventory of soils in the region and their capabilities is the first step in providing for effective soil conservation. The US Department of Agriculture Soil Conservation Service (SCS) conducts these surveys and provides data and recommendations on the capabilities of each soil series for agricultural, forestry, and engineering applications. The regional planning agencies should assign a high priority to the acquisition and effective use of this information.

Currently, the IDAS has classified the soils of the Tennessee-Tombigbee Corridor into eight major soil provinces related directly to the physiography

and geology of the region. This digitized information also includes data on 59 soil attributes (e.g., drainage characteristics, acidity) which can be recalled and displayed individually or in combination.

Information and education

Most farmers are fairly well educated as to the value of soil conservation practices. This information need is a continual one, however, as there is a continual turnover of actual farm operators. Also, the general public must be made aware of this need, as a number of soil erosion and sediment pollution sources are nonfarm related. For example, airports, highways, secondary roads, borrow areas, ditches, streambanks, surface mining operations, and urban development construction sites all contribute substantial quantities of sediment to the overall problem. Grant (1972) cites a study in Georgia indicating soil losses from bare roadside cuts as high as 185,000 tons per square mile or 289 tons per acre.

The design and implementation of these programs should be based on technical guidance and information provided by the SCS, the State Extension Service, and data from the IDAS. The topic may seem basic, but the continued loss of farmlands and the amount of sediment dredged from the Nation's waterways each year indicate the need for such a program.

Taxation

Differential taxation schemes for farmlands were discussed in Part III. The regional planning agency should consider the inclusion of requirements for implementing accepted soil conservation practices on a farm in order for the farm to qualify for these tax benefits.

Regulation

Some type of regulatory program may be necessary to address the nonfarm sediment pollution sources. Mandatory mitigation and rehabilitation measures might be required for public as well as private construction works. Performance bonds could be assessed on a per acre or site basis to encourage soil conservation during and after construction.

Assistance

A number of soil conservation techniques are available, especially to farmers. However, these practices are often costly, and the direct return to the individual landowner is often small. What is needed is a mechanism for cooperative assistance, especially for the small farmer or developer. The county Soil and Water Conservation Districts could assist in this area by

acquiring and making available to individuals expensive equipment that is normally used on a one-time basis. For example, terracing equipment could be purchased and loaned or rented to participating farmers to allow them to install terraces on their farms.

Technical assistance on various practices such as terracing, minimum tillage, and sediment catchment basins is available from the SCS, and financial cost-sharing is often available from the USDA Agricultural Stabilization and Conservation Service (ASCS).

Regional cooperation between planning districts

As with floodplains and wetlands, soil conservation is a problem that transcends political boundaries. The various regional planning agencies in the Corridor should develop and pursue common goals and objectives for the overall conservation of farmlands and the reduction of sediment pollution of the region's waterways.

References

Berg, N. A. 1981. "USDA Goals for Strengthening Private Land Management in the 1980's," Transactions of the North American Wildlife and Natural Resources Conference, Vol 46, pp 137-145.

Grant, K. E. 1972. "Soil Erosion: New Problems and Solutions," Transactions of the North American Wildlife and Natural Resources Conference, Vol 37, pp 415-421.

PART VI: FOREST RESOURCES

Introduction

Forestlands in the Tennessee-Tombigbee Corridor are important assets which provide a variety of benefits ranging from economic products to aesthetic qualities. These benefits can be grouped into five broad categories: (a) wood products, (b) water, (c) visual appeal, (d) wildlife, and (e) recreation. The benefits actually produced in an area are variable and depend on the inherent capabilities of the land, the plant and animal communities and species adapted to the area, the objectives and type of management practiced, and the prevailing social and economic climate. All of these factors should be considered in the development and implementation of planning and management alternatives.

Forest resources can be thought of in terms of three basic land ownership categories: (a) public lands, (b) private industrial lands, and (c) private nonindustrial lands. Public forestlands include those owned by various Federal, State, and local agencies and managed to provide benefits for the general public. Private industrial forestlands include those owned by corporations and managed specifically to produce commercial forest products designed to maximize benefits to the corporation. Private nonindustrial forestlands include those lands classified as forestlands, owned by private individuals, and managed to achieve the individual landowner's objectives.

Cooperation among the regional planning agencies, the public forestry agencies, and the private landowners (industrial and nonindustrial) is necessary in order to formulate regional goals and to implement effective programs to accomplish those goals. Public forestry agencies and corporations normally have adequate technical staffs to conduct detailed programs designed to accomplish these objectives, while the private nonindustrial landowners generally do not. Consequently, the focus of the alternatives developed below will be on developing cooperation among the various public and private entities involved, and providing assistance to the private nonindustrial forest landowner group.

The definitions of terms commonly used in describing forest resources (Murphy 1973) are given below to promote an understanding of the concepts involved.

a. Forestland. Land at least 16.7 percent stocked by forest trees of any size, or formerly having such tree cover and not currently developed for nonforest use.

b. Commercial forestland. Forestland that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization.

c. Nonstocked land. Commercial forestland less than 16.7 percent stocked with growing-stock trees.

d. Unproductive forestland. Forestland incapable of yielding crops of industrial wood because of adverse site conditions.

e. Growing stock trees. Sawtimber trees, poletimber trees, saplings, and seedlings; that is, all live trees except rough and rotten trees.

f. Stocking. A measure of the extent to which the growth potential of the site is utilized by trees. Stocking is determined by comparing the stand density in terms of number of trees or basal area with a specified standard.

g. Basal area. The area, in square feet, of the cross section at breast height (4.5 ft (1.4 m) above the ground) of a single tree or of all of the trees in a stand, usually expressed as square feet per acre.

Planning and Management Alternatives

The alternatives developed below are oriented toward the general goal of promoting good stewardship of forestlands. This concept of good stewardship implies developing and maintaining a supply of raw materials (trees) adequate to meet present and anticipated future demands for forest products. This concept also implies that the management of forest resources will be practiced such that the nonmarket benefits to the public are considered as well. These market and nonmarket aspects should be considered and combined to optimize the total net benefits to society.

Information and education

Forest management alternatives can be thought of as options occupying positions along a continuum extending from preservation on one hand to intensive commercial utilization on the other. Public support for various points on this continuum generally depends on public concepts of the impacts and implications of implementing these alternatives. To help ensure constructive public involvement in planning the use of these forest resources, and to help guide decisions made by the landowner, the regional planning agency could

develop an information and education (I&E) program addressing these concerns.

This regional I&E program is directed at three basic audiences: (a) the private nonindustrial forest landowner, (b) the local (city and county) planning commissions and private realtors, bankers, accountants, and other interests that relate specifically to the private landowner, and (c) the general public. This program should attempt to educate these audiences to the opportunities and benefits available to, and the responsibilities incumbent upon, them in managing regional forest resources.

For private nonindustrial forest landowners, the I&E program emphasis should be on the economic benefits and opportunities available as well as the personal nonmarket objectives that can be achieved through increased management and better stewardship of their forestlands. The emphasis of the program directed at the local planning commissions, realtors, and financiers should be to develop an awareness of the various nonmarket values (e.g., visual qualities, recreational use) associated with the forest resources, and to develop a better understanding of the problems and potentials that are peculiar to forest investments. The I&E program directed at the general public should emphasize: (a) the overall benefits occurring to individual landowners and to society through various forest management programs, and (b) the responsibilities of all parties to manage wisely and to practice good stewardship of the region's forest resources.

The regional planning agency could act as an information clearinghouse for the region by coordinating the information and assistance provided by various sources with the specific needs of the region. A number of sources can be utilized to provide assistance in developing a regional I&E program for forest resources. The US Forest Service Southeastern Forest Experiment Station, Asheville, N. C., and the Southern Forest Experiment Station, New Orleans, La., conduct basic and applied forestry research and publish their findings for public use. The State and Private Forestry Program, also a part of the US Forest Service, interprets these technical findings and disseminates the information in layman terms for the nonscientific community. The various State Forestry Commissions also disseminate technical and layman information, generally through a system of county foresters. The State Extension Service (generally affiliated with the land-grant university of the state) will often conduct a number of forestry workshops offering technical information and instruction in various aspects of forestry (e.g., inventory,

management plans, stand improvement, sales, and regeneration). The Tennessee Valley Authority (TVA) has a technical forestry staff designed to provide technical assistance to private nonindustrial landowners in the TVA region. Various conservation groups and professional societies (e.g., the State Wildlife Federations, The Wildlife Society, The Society of American Foresters) can provide management recommendations and technical information for market and nonmarket uses of forestlands. Also, the various private forest industries operating in the area and various trade associations affiliated with the utilization and stewardship of forest resources would probably be willing to assist in developing these I&E programs.

Assistance

The regional planning agency could act as a facilitator in developing assistance programs for local forest landowners. The planning agency could assess the local needs and coordinate with the appropriate State and Federal agencies which would then actually provide the help. Potential assistance programs could include such topics as: (a) market information, (b) markets for minor species and products, (c) resource inventories, and (d) incentive.

Lee (1980) and Marler (1980) noted that private nonindustrial landowners have expressed a need for adequate market information for forest products. These landowners would prefer to have a system that would provide prices and market trends that they could use in deciding when and how to sell their forest products. Currently, the individual landowner has to rely on the advice of log buyers, which may not always be to the landowner's best interest (Marler 1980).

The planning agency should consider the possibility of helping encourage the development of new markets for regional forest products. These new markets should emphasize the nontraditional uses of products from forestlands. For example, markets for minor species and products (e.g., firewood) may be quite helpful in implementing stand improvement practices that the landowner might not otherwise consider.

Resource inventories represent another way the planning agency could assist the regional forest landowners. Better data on the resources available and the demands for those resources would be helpful to the landowner and to his financial advisors. This information is generally collected by the US Forest Service in statewide surveys conducted every 10 years, but some regional supplementation in the interim would be of use. The IDAS developed

for the Tennessee-Tombigbee Corridor currently contains information on land cover (processed from LANDSAT), wildlife resources, soils, and flood hazards; additional forestry data could probably be added later.

Financial incentives are another area in which the regional planning agency can help, again primarily by coordinating applicable programs. Cost-sharing for reforestation and timber stand improvement is available through the USDA ASCS (Forestry Incentives Program (FIP) and ASCS cost-sharing) and through the State Forestry Commissions (Forest Resource Development Program). However, according to Shaw and Gansner (1975), a timber and wildlife incentive program aimed at private woodland owners should satisfy three basic requirements: (a) these incentives should encourage long-term retention of woodlands, (b) they should encourage continued maintenance of those woodlands, and (c) they should provide for continual public access to forest products. Any assistance program designed by the regional planning agency should consider these factors.

Taxation

Lee (1980) and Marler (1980) summarized the concerns expressed by landowners in a series of four regional conferences on the management needs on private nonindustrial forestland. The principal concern of these landowners was a need to bring equity to the tax structure so that the management of forestland for timber and other forest values is treated as a management activity and not as a depletable, exhaustible resource. Expressed concerns indicated that tax disincentives promote the displacement of forests by other land uses.

As a remedy to this situation, the regional planning agency could work to develop the adoption of a property taxation schedule that would encourage private landowners to maintain and develop forest resources on their property. These efforts could include at least three basic strategies:

a. Tax reductions in all categories (property, capital gains, and inheritance).

b. Tax incentives for management (investment tax credits; expensing of reforestation, timber stand improvement costs; and accelerating write-offs).

c. Simplification of the tax codes and provision of competent tax advice to forest landowners so that the landowner is assured of full benefits.

An example of one approach to tax incentives for forest landowners is Connecticut's "Farm, Forest and Open Space Current Use Tax Law," enacted in 1963 and amended in 1971 and 1973. Under this law, a landowner can include a minimum of 25 acres of woodland in a 10-year renewable contract with the State to have the land assessed for property taxes on the basis of its "current use value" rather than its "highest and best use." The program is administered by the local tax assessor, the State Forester, the State Tax Commissioner, and the municipal planning commission (Shaw and Gansner 1975).

Purchase and management of forestlands

As a general rule, the private forestlands of the region should be retained under private ownership and management. However, the planning agency should retain the option of having a mechanism (e.g., purchase or easement) to attempt to step in and protect forestlands having significant public values that are threatened with conversion to other land uses.

References

Lee, J. C. 1980. "Management Needs on Private Nonindustrial Forest Lands: A Summary of Four Regional Conferences," Transactions of the North American Wildlife and Natural Resources Conference, Vol 45, pp 323-327.

Marler, R. L. 1980. "A Report on the National Private Nonindustrial Forestry Conference Held in Washington, D. C., November 26 and 27, 1979," Transactions of the North American Wildlife and Natural Resources Conference, Vol 45, pp 328-332.

Murphy, P. A. 1973. "Alabama Forests: Trends and Prospects," USDA Forest Service, Southern Forest Experiment Station Research Bulletin SO-42.

Shaw, S. P., and Gansner, D. A. 1975. "Incentives to Enhance Timber and Wildlife Management on Private Forest Lands," Transactions of the North American Wildlife and Natural Resources Conference, Vol 40, pp 177-185.

PART VII: WATER RESOURCES

The water resources in the Tennessee-Tombigbee Corridor include ground-water and stream sources. The Corridor Study has included substantial work on assessing water supply resources and future needs and on developing water supply alternatives. The Environmental Inventories provide information on freeflowing streams and possible recreational facilities. Environmental planning and management alternatives presented here focus on use of this existing information, with IDAS support to plan for development of surface-water resources (ground water is covered in Part VIII). Alternatives considered are for water supply, conjunctive use, and recreation and natural preservation.

Water Supply

A comprehensive study was made of the water supply resources of the 51 counties in the Corridor study area. The study was intended to determine the quantity and quality of water available and being consumed and then to determine water supply problems and propose alternatives for the problems (USACE 1981). Information was compiled on water use and supplies for community water supply systems, industries, and electric power generation plants. Sources of information for water use and supply in each of the states were identified (Frnka et al. 1980). Based on this information, water supply problems and alternatives were assessed (USACE 1981). The problems identified are:

a. Treatment. Water system(s) with mechanical inadequacies resulting in unsatisfactory treatment of water.

b. System design capacity. Water system(s) operating at or near hydraulic design capacity.

c. Storage capacity. Water system(s) without sufficient storage to meet average daily use.

d. Declining ground-water levels. Ground-water supply threatened by declining water tables.

e. Surface water low flow. Surface water supply threatened during low-flow conditions.

The summary report of the water supply study assessed the counties for each of the problems and recommended one or more of the three alternatives to

address the problems (USACE 1981). The general alternatives proposed for the problems are:

a. Development of new sources. The location and development of new water supply sources.

b. Intersystem connections. Two or more water systems interconnecting together.

c. Service new areas. Service surrounding areas not presently served by the water system(s).

Information sources

Water supply planning, at a preliminary stage, can utilize the information from the Water Supply Study. Data on water use and supply are summarized for each county in the water supply reports (Harris and Ferrell 1982). The IDAS data base can delineate the water supply service areas as determined by the water supply reports. The detail of these data provides a basis or framework that would have to be developed, refined, or updated by local planners or their consultant.

Institutional considerations

During the Water Supply Study, it was recognized that development of alternative solutions is addressed on a location-specific basis and that in many cases "implementation of necessary institutional and financial strategies that accompany a particular engineered solution is more difficult than the actual engineering solution itself." Phase II of the Water Supply Study examined the alternative institutional and financial strategies available for water utilities within the Corridor area and is intended to serve as a guide to planners in the Corridor for planning and implementing a water supply system (Cullinane and Condra 1984). The report presents a general planning method for water supplies (Part II). The institutional arrangements possible for water supply development and management are explained for each state. The differences in the institutional arrangements, e.g., taxing, eminent domain powers, are explained for the management entities authorized by state statute. Ground-water and surface-water laws are also summarized (Part III).

Financial implementation for a water supply includes funding for capital and operating income. The sources of revenue include local sources of operating income, local sources of capital, and intergovernmental sources of capital. The characteristics of different rate structures and operating income sources are examined along with local sources of capital. Intergovernmental sources of financial aid include Federal programs administered by the Farmers

Home Administration, Economic Development Administration, and Small Business Administration. State financial assistance comes primarily in the form of State administration of the Community Block Grant Program and State aid for construction of water systems (Part IV).

Conjunctive Use

Water resources of the Tennessee-Tombigbee Corridor are generally plentiful. Water supply is primarily from ground-water resources. The use of surface water in conjunction with existing ground-water sources is being given greater attention due to the decrease in ground-water levels as a result of increased use. The industrial and commercial development that accompanies operation of the Waterway could produce changes in water demand. Conjunctive use of surface-water and ground-water resources can result in more effective use of surface supplies and decreases the demand on aquifer supplies, thus allowing for development while protecting the aquifer (McArthur and Brammer 1983). Due to the legal and institutional considerations, institutional changes are necessary for implementation of conjunctive use plans. Conjunctive use utilizes the same data sources as water supply planning.

Recreation and Natural Preservation

The streams in the Corridor present a valuable recreation resource. In addition, the abundance of natural, unaltered, primarily small streams is a natural resource that should be protected. A number of recreation areas are possible with development of existing and proposed sites along the Waterway. Existing and proposed facilities for the Corridor planning areas (Regions I-X) are summarized in Chap. III of each of the Environmental Resource Inventories (USAED, Nashville and Mobile 1983).

Free-flowing, unaltered streams are environmentally valuable because they maintain the natural riparian and scenic character of the stream. To encourage preservation, Congress passed the Wild and Scenic Rivers Act to protect natural, unaltered and scenic rivers. The purpose of designation of a stream under this Act is to protect the streams or rivers from development or other activities by man that will cause a degradation in the environmental value of the stream. Two of these streams, the Escatawpa River in Alabama

and Mississippi and Soldier Creek in Alabama, are within the Corridor. Tennessee and Kentucky have enacted state wild and scenic river programs. The Corridor area includes portions of two of the Tennessee-designated rivers, but none of the Kentucky-designated rivers.

Local planners can develop or encourage programs for protection of the unaltered, natural streams within the Corridor. This could include nomination for state (Tennessee and Kentucky) or national designation as a scenic river or implementation of a local publicly sponsored protection program. Numerous unaltered streams are contained in the Corridor. The Environmental Resource Inventories contain information about the character and use of the major free-flowing streams in the Corridor. This information can be used to identify streams for preservation. The IDAS has maps of larger streams and water bodies (large enough to be sensitive to a 15-acre grid cell). These maps may not show some smaller streams.

References

Cullinane, M. John, Jr., and Condra, Janet S. 1984. "Handbook for the Institutional and Financial Implementation of Water Utilities," Miscellaneous Paper EL-84-5, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. (prepared for USAE Districts, Nashville and Mobile).

Frnka, Robert L., et al. 1980. "Completion Report for Part 1 of Phase I of Water Supply Study, Tennessee-Tombigbee Corridor Study," (prepared for USAE Districts, Nashville and Mobile).

Harris, Wiley F., and Ferrell, James W. 1982. "Lee County Mississippi Water Supply Study," Tennessee Valley Authority, Norris, Tenn.

Jarman, M. Casey, Sage, A. L., III, and Hooper, William, Jr. 1983. "Legal Analysis of the Lee County Water Supply Problem," Technical Completion Report, Project No. A-138-MS, Mississippi Law Research Institute School of Law, University of Mississippi, University Miss. (prepared for Water Resources Research Institute, Mississippi State, Miss.).

McArthur, Robert E., and Brammer, Dana B. 1983. "Institutional Framework for Conjunctive Use of Surface and Groundwater in Tupelo-Lee County, Mississippi; Phase II," Technical Completion Report A-137-MS, Bureau of Governmental Research, University of Mississippi, University, Miss. (prepared for Water Resources Research Institute, Mississippi State, Miss.).

US Army Corps of Engineers. 1981. "Tennessee-Tombigbee Corridor Study Water Supply Summary Report," (prepared by USAE Districts, Nashville and Mobile).

US Army Engineer Districts, Nashville and Mobile. 1983. "Environmental Resources of the Tennessee-Tombigbee Corridor," Regions I-X (prepared by Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.).

PART VIII: GROUND WATER

Ground Water and Ground-Water Regulation

Policy and management for ground-water resources has developed separately from management of surface water. Rights for allocation of water vary between states (Howells 1978). Further, State administration of ground-water responsibility differs, as shown in Table 4.

Table 4

Administrative Responsibility for Ground-Water Management

Function	Alabama	Kentucky	Mississippi	Tennessee
Use management				
Program development and implementation Planning Permitting Implementation Monitoring Enforcement	Alabama Dept. of Environmental Management	Natural Resources and Environmental Protection Cabinet, Division of Water	Department of Natural Resources	Department of Health and the Environment, Division of Water Management
Data collection and research	Geological Survey of Alabama			
Quality management				
Regulation of surface activities	Alabama Dept. of Environmental Management	Natural Resources and Environmental Protection Cabinet, Division of Water	Department of Natural Resources	Department of Health and the Environment, Division of Water Management
Drinking water control			State Board of Health	

Part of the variability in ground-water management is due to the nature and perception of the resource. Ground water is basically an unseen resource. Pollution of ground water does not result in unsightly aesthetic effects. The legal doctrines and institutional arrangements developed by states are based in the historical "tie between water rights and land ownership and the widespread abundance of surface and ground water" (Devine et al. 1983, Chap. 5).

All of these factors complicate local planning for ground water.

Federal regulation of ground water has focused on public health protection by protecting ground water used as drinking water sources (Devine et al. 1983, Chap. 4). These regulations apply to activities that can affect the quality of ground-water supplies. Except for the water quality planning requirements (Clean Water Act and Federal Water Pollution Control Act), ground-water protection is addressed as an issue impacted by some other regulated activity, e.g., solid waste disposal. The Safe Drinking Water Act (1974) established quality criteria for drinking water and required states to develop programs to regulate deep-well injection of wastewater. Protection of ground water and recharge zones from land disposal of municipal wastes and hazardous wastes management is required by the Resource Conservation and Recovery Act (RCRA) of 1976. Aquifer protection is supposed to be considered in formulating area-wide water quality plans (208 area-wide planning, 303 water quality implementation plans, and National Pollutant Discharge Elimination System permits) (see state water quality standards sections, Part XIV) under the Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977. The Toxic Substances Control Act of 1977 does not specifically consider ground-water protection but does apply to disposal of substances posing an "unreasonable risk." The Surface Mining Control and Reclamation Act of 1977 protects ground water in areas of heavy surface mining. The Act provides for prevention of chemical contamination and hydrologic disruption of ground water (Devine et al. 1983, Chap. 4). The state implementation procedures for these laws, where applicable, or for similar activities not covered by Federal laws, may or may not contain provisions for protection of ground water.

State regulation of ground water

As pointed out above, the Federal role in ground-water management has focused on protection of drinking water supplies (General Accounting Office 1984). The trend is toward a lesser Federal role in ground-water management. The states have historically played the dominant role in ground-water management. The states have roughly divided management into two areas: ground-water supply and allocation and ground-water quality issues. Local and county governments are involved as water system suppliers or operators, and the governments basically respond to State laws and institutions. For instance, proposed regulations now under consideration in Mississippi would allow the Department of Natural Resources to forewarn communities of potential water

shortages, so that local management measures could be implemented to prevent shortages (Clarion-Ledger, 1984a, b). The purposed rules recommend that the State issue permits for ground-water use. If local communities did not take measures to address the potential water shortages, the State could refuse further permits. In this way local development would be controlled by state policy. The local governments are still responsible for solving the water problem. Cullinane and Condra (1984) examined the different water supply authorities and institutions allowed under state laws in the Tennessee-Tombigbee Corridor.

The ability of local governments to implement alternatives is limited by the state's enabling legislation. Devine et al. (1983) made a comprehensive study of alternatives for ground-water management in the southeastern states. The alternatives examined for water supply and protection of ground water covered the range of implemented and conceived alternatives for ground-water management. Many of these alternatives, if implemented, would require institutional changes locally or at the state level, changes in overall state water policy, and new enabling legislation or other legislative changes. These alternatives, while technically feasible for ground-water management, may be unlikely management and protection alternatives for the Tennessee-Tombigbee Corridor due to the extensive institutional changes, costs, and lack of public support.

Sources of ground-water data

The state decisions on ground-water allocations and policy are based in part on ground-water well records and monitoring systems collected by the states. Data sources are contained in Tables 5 and 6. In addition to available data, local planning decisions require expertise in hydrology and water systems for correct interpretation of data.

Management and Protection Alternatives

Tables 7-9 show the policy options examined by Devine et al. (1983) for ground-water quality protection, water supply, and land use controls. Examination of these options reveals that those options likely to have the greatest effect on ground-water management require initiation or implementation at the State or Federal level, e.g. desalination or modification to existing water laws, rather than at the regional or local level. The alternatives

Table 5

US Geological Survey (USGS) and Environmental Protection Agency (EPA) Data Bases*

Common Acronym	Name	Content Summary	States Whose Agencies Commonly Use Data Base
USGS			
WATSTORE	Water Data Storage and Retrieval System	Major USGS data base that contains data on surface and ground water quality, availability, and use.	All states
GWSI	Ground Water Site Inventory	A subfile of WATSTORE that provides data on well location, logs, and construction features.	All states
NAWDEX	National Water Data Exchange	An indexing system to inform users of available hydrologic data (flows and quality).	All states
NWUDS	National Water Use Data System	States acquire data on water withdrawal and use. Storage and dissemination system maintained by USGS (a part of WATSTORE).	Mississippi
EPA			
MSIS	Model State Information System	For reporting use of public water supplies. Contains some quality information.	Alabama
STORET	Storage and Retrieval of Environmental Data	Water quality data for surface and ground water. State and local governments can store their data. Contains analytical software.	

* Adapted from Devine et al. 1983.

Table 6

Ground-Water Monitoring and Data Management of US Geological Survey*

State	No. of Water-Level Wells		No. of Water Quality Wells	Selected Special Study Area
	Continuous	Periodic		
Alabama	32	240 (semiannually)	100	--
Kentucky	75	175 (annually)	100	Five recent studies--one applied; four ground-water models in surface-mined areas. Another examined water quality data.
Mississippi**	200	--†	200 once every 5 years for salt-water intrusion	Lee County-digital model on ground-water resources.
Tennessee	24	12	--	

* Adapted from Devine et al. 1983.

** Cooperates with Bureau of Land and Water Management; also has electric logs, water-well drillers' records since 1955 (70,000 wells), and computerized data for wells < 50 gpm.

† None or uncertain.

Table 7

Ground-Water Quality Policy Options*

Objective	General Area	Specific Option
Regulate sources of pollution	Septic tanks	Improved technologies
		Control septic tank cleaners
		Centralize drinking water supplies
		Manage land use
		Improved septic tank codes
	Runoff controls	Agricultural controls
		Urban and suburban controls
	Energy and mineral production	Noncoal mining controls
		Improved controls in the petroleum industry
	Hazardous waste facility	Hazardous waste collection and storage services
		Local or state manifest system
		Local siting authority
		Centralized state authority
Manage aquifers	Establish standards for ground-water quality management	Effluent standards
		Permits for ground-water discharge
		Nondegradation strategy
		Ambient numerical standards
		Aquifer classification
	Rehabilitate aquifers	Abatement
		Cleanup
		Restoration

* Adapted from Devine et al. 1983.

Table 8

Water Availability Options

General Category	Options
Allocate ground-water resources	Modifications to existing water laws Permitting systems
Provide adequate supply	Expanded use of surface water Well field development and management Desalination Subsurface storage and retrieval Artificial recharge
Manage demand	Conservation Pricing alternatives Pump taxes

* Adapted from Devine et al. 1983.

Table 9

Land Use Options*

Approach	Specific Option
Planning	Comprehensive land use planning Land use information
Land use controls	Zoning Performance standards Purchase of land or land rights Financial incentives Development and construction design standards Ground-water classification based on land use standards
Siting controls	Siting procedures for high-risk facilities

* Adapted from Devine et al. 1983.

outlined herein are more to be within the jurisdiction of the local planning authorities. The alternatives would require promulgation of county or municipal ordinances or regulations on land uses or changes to existing regulations.

Regulation of sanitary landfills and hazardous waste disposal sites

Aquifer recharge zones can be protected from pollution by proper siting of sanitary landfills and hazardous waste disposal sites. Runoff and leaching from the sites can contaminate ground water (Thackston et al. 1983). Operation and siting of sanitary landfills are regulated for public health, and ground- water considerations can be readily incorporated into siting considerations. RCRA regulations do not apply to hazardous waste generators of less than 1 ton per month (Devine et al. 1983, Chap. 6). Substantial amounts of dangerous wastes could conceivably be disposed, which could result in groundwater pollution. RCRA requirements for use of impermeable liners and groundwater monitoring for hazardous waste disposal sites could be extended to small generators (Thackston et al. 1983). Other measures to protect ground water from hazardous waste contamination include: (a) providing local hazardous waste collection and storage services, such as for polychlorinated biphenyl (PCB) fluids, (b) local manifest systems, (c) operation of a hazardous waste disposal facility by the local government, and (d) establishment of a hazardous waste siting board, as in Tennessee (Devine et al. 1983, Chap. 6).

Regulation of abandoned or nonproducing water wells

Pollution of ground water can occur from improper sealing of shallow water wells and improper plugging of abandoned wells (Thackston et al. 1983). Well drilling and operation are state-regulated activities, and regulations could require changes in state policy.

Revision or implementation of septic tank codes

Existing septic tank codes should incorporate requirements for the use of the latest technology to minimize threats to ground-water quality. Ideally, septic tank codes should incorporate the following components (Devine et al. 1983, Chap. 6):

a. Criteria to ensure that septic tank-soil absorption systems are allowed only where soil conditions, geology, aquifer characteristics, and topography are suitable.

b. Improved design and installation specifications and onsite inspection.

c. Provisions for regular inspections and maintenance, including reporting the method of septage disposal (approved landfill or through a sewage treatment plant).

Septic tank codes usually enforce restrictions based on elements such as drainage field design and standards for minimum lot size, ground slope, percolation rate, and depth to ground water. Incorporating the above components into existing codes would prevent degradation of ground-water resources. Significant amounts of technical expertise would be required for development and implementation of these codes.

Incorporation of ground-water considerations in planning functions

Local planners provide input to various plans through informal or required review and comment procedures. Drainage and stormwater plans, agricultural runoff control plans, and energy and mineral development plans should be reviewed for potential impacts to ground water.

Fertilizers, pesticides, and other urban pollutants and nutrient substances become part of the normal drainage. Stormwater can mix with the drainage, and percolation of the mixture results in ground-water pollution. Where possible, separate or partially separate systems for stormwater and drainage are highly desirable. Use of screening devices, filters, and other traps improves water quality of the drainage and stormwater. Vegetation aids in removing excess nutrients and other pollutants from runoff before percolation into the ground. Land use regulations can be implemented to control stormwater runoff (Devine et al. 1983, Chap. 6).

Plans addressing agricultural practices should take into account the ground-water impacts of pesticide management and the pathogens and oxygen-demanding substances from feedlots (Devine et al. 1983, Chap. 6).

Development practices for petroleum and mineral resources can cause ground-water pollution. Some of these activities are covered under the Underground Injection Control (UIC) Program. Compliance with UIC regulations and normal precautions, e.g., runoff control, to protect ground water should be ensured (Devine et al. 1983, Chap. 6).

References

Clarion Ledger. 1984a (14 Jun). "Council Proposes Policies to Regulate State Ground Water," Jackson, Miss.

Clarion Ledger. 1984b (18 Jun). "State Taking Helm to Regulate Use of Dwindling Ground Water," Jackson, Miss.

Cullinane, John M., Jr., and Condra, Janet S. 1983. "Handbook for the Institutional and Financial Implementation of Water Utilities," Miscellaneous Paper EL-84-5, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. (prepared for USAE Districts, Nashville and Mobile).

Devine, Michael D., et al. 1983. "Ground Water Management in the Southeastern United States, Final Report," EPA-600/2-83-090, US Environmental Protection Agency, Washington, DC (prepared by Science and Public Policy Program, University of Oklahoma, Norman, Okla.).

General Accounting Office. 1984. "Federal and State Efforts to Protect Ground Water," GAO/RCED-84-80, Washington, DC.

Howells, David H. 1978. "A Summary Report, Southeast Conference on Legal and Administrative Systems for Water Allocation and Management," Water Resources Research Institute, University of North Carolina, Chapel Hill, N. C.

Thackston, Edward L., et al. 1983. "Water Policy in Tennessee: Issues and Alternatives," Technical Report No. 41, Environmental and Water Resources Engineering, Vanderbilt University, Nashville, Tenn.

PART IX: CULTURAL RESOURCES

Culture can be considered to be the "total inheritance that human beings organized in society receive from their forebears, generally enlarge, and pass on to successive generations" (Farb 1978). As such, culture encompasses beliefs; habits; traditional values; and structures or sites for religious, commercial, agricultural, and industrial endeavors (Linton 1964). The term "cultural resources" emphasizes the physical or tangible parts of culture. Beliefs, habits, and values are documented in written or spoken form, but it is through the tangible evidence of culture that the present generation most readily understands what the past was like. More importantly, it is the case that the tangible evidence and artifacts are most susceptible to loss through destruction or deterioration. These physical resources include the historic and prehistoric archaeological sites, historic structures, historic technology, and paleontological sites (McHale 1970). There has been significant Federal and State legislation (Table 10) that sets policy for preservation and prevents destruction of these resources. Table 10 illustrates that local and state cultural resources became a national priority with establishment of the National Register of Historic Places in 1966. The 1966 legislation also made a priority of the preservation of privately owned properties, with consent of the owners, through nomination for the National Register.

Responsibilities of Local Planners

Protection of significant national, state, and local cultural resources is national policy. The designation of sites, structures, and districts pursuant to the 1966 National Historic Preservation Act has resulted in effective state and local organizations and procedures for pursuing the goals of preservation of historical and archaeological resources. Examination of the laws in Table 10 shows that preservation of private properties is limited to protection only under the National Historic Preservation Act. That is, the impact of Federal actions on cultural resources is protected. However, protection, maintenance, and preservation of privately owned properties require the consent and cooperation of the owner. Similarly, archaeological sites encountered in private construction are under no protection for preservation or documentation of the site. There are measures and actions local planners can

Table 10

Cultural Resources Legislation

Legislation	Policy	Applicability
1906 Antiquities Act	Protected historic or prehistoric ruins on public lands from destruction (through penalties).	Authorized the President to set aside historic places, landmarks, structures, and lands of significant scientific, natural, and scenic value.
1935 Historic Sites Act	Made a national policy of preservation for public use of historic sites, buildings, and objects of national significance.	The Secretary of the Interior was empowered to survey, document, acquire, and preserve archaeological and historical sites. The National Park Service was given responsibility for supervision of the Nation's historic preservation effort.
1949 Establishment of National Trust for Historic Preservation	The National Trust was authorized to receive buildings and objects significant in American history and culture and to administer the properties.	The National Trust was established to manage and acquire properties.
1966 National Historic Preservation Act	Preservation efforts were expanded to sites of state and local significance.	The National Register of Historic Places was established for the purpose of including "sites, structures, and the like which are significant in American history, architecture, archaeology, and culture," and encouraging local, regional, and national interest in the protection of such properties.

(Continued)

Table 10 (Continued)

Legislation	Policy	Applicability
1966 National Historic Preservation Act (Cont.)		Grants to states were provided for comprehensive surveys of eligible properties. Advisory Council on Historic Preservation was established to advise the President and Congress on historic preservation. Established procedures for nomination of state and local sites and properties to the National Register. (State Historic Preservation Officer and state review boards recommend nomination to the Keeper of the National Register.) Grants are provided to local governments and public groups for historic and architectural preservation and for local surveys of properties.
1969 National Environmental Policy Act	Made a national policy of protection and enhancement of environmental resources.	An assessment of impact to cultural resources was required for major Federal actions affecting the environment.

(Continued)

Table 10 (Concluded)

Legislation	Policy	Applicability
1974 Archeological and Historical Preservation Act	Extended protection requirements for artifacts and information to Federally assisted or Federally licensed projects (e.g., waste-water treatment plant grants). This law authorizes up to 1 percent of the Federal cost for recovery of data.	This Act requires that requests for Federal grants, loans, or other assistance be examined to see if cultural resources will be affected.
1979 Archaeological Resources Protection Act	Prohibits removal of archaeological resources from public lands or Indian lands without Federal or Indian permission.	
1980 Amendments to the Historic Preservation Act of 1966	Sets up the process for the state certification of local historic preservation programs, along with responsibilities of the State Historic Preservation Officer.	This required the Secretary of the Interior to establish criteria for properties to be included and removed, and for determinations of eligibility for the National Register.
	Established responsibilities of Federal agencies to administer the cultural resources under their jurisdiction.	Artifacts and associated information are to be deposited in institutions with long-term curatorial capabilities. Advisory Council is responsible for guidelines for Federal agencies for preservation of properties in Federal control or ownership.

take to encourage better management of cultural resources, but responsibility lies with private citizens.

For projects which are Federally funded or assisted by grants or loans, the cultural resources affected will be identified during the A-95 review process. This review should identify historic and archaeological sites and structures which may be destroyed or endangered by the projects. Depending on the significance of the resource or potential for uncovering a resource, plans for mitigation or preservation are developed.

Planning and Management Alternatives

The local or regional planner can promote more effective management of cultural resources by identifying actions that may impact on cultural resources. Except as provided in the A-95 review process, consideration of cultural resources may not be part of standard planning practices. The alternatives are listed in order from strict legal requirements to more active management of cultural resources. The planning and management alternates are as follows:

a. Compliance with existing Federal, State, and local cultural resource management laws and regulations.

b. Implementation of procedures for incorporation of cultural resources into standard planning procedures.

c. Enactment of local regulations to attain preservation objectives.

d. Local government program certification.

Data sources

As part of the Environmental Inventory in the Corridor Study, a compendium was prepared of archaeological sites and sites on or eligible for the National Register of Historic Places (Davis et al. 1981). This document summarized much of the information available from state or local cultural resources agencies and groups. Due to its scope (all 51 counties are included), the level of detail of information for a particular project will likely require the use of local or state expertise to supplement the documentation.

Strict compliance alternative

Compliance with Federal, State, and local statutes for cultural resource management will ensure that historic and archaeological structures and sites will not be destroyed. For areas without State or local preservation

programs, those properties not affected by Federal actions can still be disturbed, modified, or destroyed by the owners without recourse. Significant cultural resources could conceivably be destroyed. Table 10 summarizes the Federal requirements, and Davis et al. (1981) outline the laws for each State.

Incorporation of cultural resources into planning functions

Any future development or project in the Corridor can conceivably affect cultural resources, either identified sites or sites encountered during construction. Planned projects, if not Federally funded or not in a historic district, may not be required to account for cultural resources. Documentation of cultural resources in a project area and consideration of potential impacts on those resources due to the project can strengthen any planning analysis. Davis et al. (1981, Part III) set out general procedures for considering the cultural resources affected by a project. These procedures, which are summarized below, emphasize identification of and mitigation for archaeological sites, although they are similarly applicable to historic resources. These basic procedures should be followed to the extent possible to ensure that significant cultural resources are not overlooked. However, the availability of time, funding, and manpower may limit consideration of cultural resources and implementation of these procedures for planning where cultural resources are not explicitly part of the planning approach.

Preliminary assessment. The purpose of the preliminary assessment is to bring together all existing information on the cultural resources at the proposed site or alternative sites. The intensity of this data search will be limited by the ready availability and pertinence of material. The historical information should be supplemented, where possible, by interviews with local residents and information from local organizations. It is desirable to have field reconnaissance by someone trained in cultural resources to confirm the findings of the data review. The results of these activities can provide the local planner with a comprehensive assessment of the potential cultural resources in the area affected by the proposed project. If a specific site has been selected and funding and time are available, a complete archeological survey with both hand and mechanical testing can be planned to determine the nature, extent, and significance of cultural resources. If an archeological survey is not undertaken, the assessment results are incorporated into the

planning documents. Although the results may not be as definitive as a complete survey, the assessment can provide adequate basis for incorporating guidance for cultural resource protection into a project.

Survey and testing. The survey and testing of a site must be done by a trained field cultural resource specialist. The sites identified in the preliminary assessment must be tested to determine the extent of placement of cultural materials. To determine the approximate time period(s) of site occupancy, sufficient cultural materials must be collected for analysis. Some form of mechanical testing, e.g. backhoe, may be required to determine presence of deeply buried sites. If deeply buried sites are identified, the excavation will have to be expanded to the extent necessary to determine the size of the site, the exact cultural components present, and potential significance. Upon completion of the survey, the report to the planner will include a summary of testing, sites identified, results of analysis, and also an evaluation of eligibility of each site for nomination to the National Register of Historic Places.

Mitigation. Mitigation is the process of ameliorating or minimizing the impacts to cultural resources caused by a proposed project. On Federally funded projects, mitigation is legally required (Archaeological Resources Protection Act, Historic Preservation Act). Decisions on required site mitigation are made by the State Historic Preservation Officer. Mitigation for projects not covered by Federal protection is desirable and should be considered in all plans. Decisions on mitigation are based on the significance of the site. The significance of a site is determined by the potential it has for providing meaningful scientific data concerning the history and prehistory of the region.

Impacts to cultural resources are mitigated by project relocation, protection of the cultural resources present, or salvage excavation of the site. Salvage excavation requires scheduling of excavation activities prior to most construction activities. Monitoring during construction should be part of a mitigation plan to ensure that protection measures are being implemented. Cultural materials recovered during the excavation must be analyzed, properly documented, and curated. These responsibilities should be part of the mitigation plan.

Local regulation alternative

The objectives of cultural resource protection and preservation can be

attained by local governmental bodies through local regulation. Regulation of cultural resources by local governments is promulgated under state enabling legislation allowing such local regulations (Kentucky Revised Statutes Annotated 100.201, Tennessee Code Annotated 13-7-401). The provisions of the ordinances vary with the municipality and the enabling statute.

The major thrust of the local regulations is to protect historic resources by preventing destruction or changes that may affect the historic character of the resource. The local zoning ordinances in effect in the Corridor Study Area are contained in Davis et al. (1981). These ordinances provide for protection of historic sites and structures and often designate or provide for designation of historic zones, historic-commercial zones, and special public interest districts for historic preservation (Zoning Ordinances for Cities of Paducah (Section 62) and Hopkinsville (Section E3), Kentucky). Some form of review or zoning board is usually incorporated in the protection process to approve or disapprove any changes to structures in the protected historic zones or areas. Advisory functions to the local government can be assigned to the boards (Zoning Ordinances for the City of Meridian, Nos. 3543, 3548, 3551, and 3558). Zoning or local ordinances result in preservation of cultural resources and can provide for establishment of historic districts and supervisory commissions or boards to further the local preservation objectives.

Certification of local government
programs for historic preservation

The 1980 Amendments to the Historic Preservation Act of 1966 allow local governments to assume a greater role in historic preservation. These amendments provide for establishment of protection programs by local governments. The programs can receive a portion of the State's Historic Preservation Funds allocated from the Department of the Interior. Eligibility to receive funds is dependent on meeting requirements established by the office of the State Historic Preservation Officer.

The 1980 Amendments established the broad standards on which the state bases its eligibility requirements (Tennessee Historical Commission 1984). According to the legislation, the local governments are to:

a. Enforce appropriate State or local legislation for the designation and protection of historic properties.

b. Establish an adequate and qualified historic preservation review commission by local legislation.

c. Maintain a system for the survey and inventory of historic properties.

d. Provide for adequate public participation in the local historic preservation program, including the process of recommending properties to the National Register of Historic Places.

e. Satisfactorily perform the responsibilities delegated to it under the Historic Preservation Act.

The state certification requirements set out local responsibilities. Certification requirements may include enactment of local preservation legislation, establishment of local review commissions for National Register nominations, surveys of historic properties, and public participation in the local process (Tennessee Historical Commission 1984). Where communities have existing historic district or historic property commissions, decisions are made to determine the activities delegated to each organization.

References

Davis, Henrietta R., Alison, Gloria L., and Summerville, James. 1981. "Cultural Resources of the Tennessee-Tombigbee Corridor," Urban Observatory of Metropolitan Nashville-University Centers, Nashville, Tenn.

Farb, Peter. 1978. Humankind, Houghton Mifflin Co., Boston, Mass., pp 11-14.

Linton, Ralph. 1964. The Tree of Culture, Alfred A. Knopf, New York. pp 27-40.

McHale, John. 1970. The Ecological Context, George Brazilles, New York, pp 60-72.

Tennessee Historical Commission. 1983. "Guidelines for Certified Local Government Program in Tennessee," Nashville, Tenn.

PART X: URBAN AND INDUSTRIAL LANDS

Land use along the Tennessee-Tombigbee Corridor is affected by a number of economic, demographic, and resource capability factors. Development of urban and industrial lands in an environmentally sound manner is the responsibility of the local planner. The reports and studies carried out as part of the Corridor Study can provide basic data on which to identify potential development alternatives. The broad nature of the data and the time between data collection and use of the data will likely require that the data be updated or refined or that further analysis be done for use in land use decisions. The purpose of this part is to identify the data available, some of the decision factors in urban and industrial land development, and the environmental considerations that affect each factor. The scope and outline of this part were developed with the assistance and support of Mr. Ken Goodwin, Mississippi Department of Economic Development, and the personnel of the Government Services Bureau, Mississippi Research and Development Center.

Planning for Urban Development

Urban development influenced by the Waterway can eventually result in the need for infrastructure construction. The planning for urban development will be accomplished within the existing local and regional planning framework. Urban development factors were considered in the Corridor Study in terms of human resources development and some infrastructure information, primarily transportation and water supply.

Human resources development

The population of the Tennessee-Tombigbee Corridor has been examined to identify human resource development needs and community needs caused or influenced by Waterway operation. The reports and data available are summarized in Table 11.

Infrastructure

Urban development requires a number of infrastructure components. The Corridor Study and the IDAS addressed water supply and transportation routes for the Corridor. Water supply reports were prepared for each county in the Corridor. In addition, a study was done to assist communities in the planning and financing of water supply systems (Cullinane and Condra 1984). The

Table 11

Reports and IDAS Data for Urban Development

Source	Information Available
	Human Resources Development
Corridor Study reports	Housing and community services. This study assesses the impact of economic development on housing and community service needs. The service and needs considered housing and community services, such as health services, services and facilities for the handicapped, public safety, care for the elderly, and recreation. Development of strategies for addressing the needs is limited to identifying programs of other agencies and/or possible programs to be established. Additional programs are addressed only in general terms. Populations in need. This study provides baseline socioeconomic data for each county. The report was the baseline used for the other human resource studies. These data are used to identify the size and concentrations of economically deprived target groups. Educational and vocational needs. This study gives a Corridor overview of the existing conditions and of potential educational and vocational training needs. There is a separate volume for each state, with information by county on the needs, potential industries, and a summary of occupations for those industries.
	Infrastructure
Corridor Study reports	Water supply, Phases I and II. Phase I of the water supply studies examined the available water supplies in each of the counties. A summary report was prepared in addition to separate assessment reports for each county. The Phase II report looked

(Continued)

Table 11 (Concluded)

Source	Information Available
Corridor Study reports (Continued)	at the different institutional and financial possibilities available, under each state's legal provisions for such entities as water associations and water districts. The Phase II report (WES Miscellaneous Paper EL-84-5) also provides the planning framework or guidance necessary for local or regional development of a water supply system. Guide to waterfront development activities. Contact the Mobile District for the contents of this report.
IDAS environmental data	Water supply. Water service areas are delineated based on the Phase I Water Supply Reports. Cultural features. These data identify the transportation routes as digitized from 1:24,000 US Geological Survey maps.

reports and IDAS data are also summarized in Table 11.

Planning for Industrial Lands

Use of Corridor lands for industrial development is dependent on the provision of suitable infrastructure facilities. Development of the industrial land facilities so as to protect the environmental resources requires that the planner be cognizant of environmental factors that are involved in the siting and development of industrial lands. The different factors involved in industrial land development and the environmental considerations for each are discussed below. The Corridor Study reports and IDAS data available are summarized in Table 12. The Tennessee Valley Authority assessed a number of sites in the Corridor to determine the likelihood for industrial development and potential for power marketing. An outline for assessment of the sites is included as Figure 3, and a sample assessment is provided as Figure 4.

Industrial development

Considerable information to be used for industrial development was developed for the Economic Development portion of the Corridor Study. The Economic Impact Assessment Model and the report "Industrial Location in the Tennessee-Tombigbee Corridor" can be used to identify the potential types of industries suited for the human, economic, and environmental resources of each county in the Corridor.

Site location

The choice of a particular site for an industrial location may be affected by proximity to the waterway, available water supply, and necessary disposal and transportation facilities. The environmental considerations in site location include location of the industrial site in the floodplain; wetlands located in a potential industrial site; the location of the habitat of endangered or important wildlife species; and suitability of the soils for industrial land use. Other siting considerations may include location of private homes along the channel. The IDAS data will produce the 100-year floodplain delineation, wetland classification of Corridor lands, wildlife habitats, and soil characteristics of the Corridor lands.

Table 12

Reports and IDAS Data for Industrial Development

Source	Information Available
	Economic Development
Corridor Study reports	Economic Impact Assessment Model users' manual. This model provides information on population projections, labor requirements and availability, and public cost and public expenditure resulting from a given development.
	Industrial location report. "Industrial Location in the Tennessee-Tombigbee Corridor" matches the county resources with the requirements for 20 industries. The report provides three development strategies and ranks the 20 industries according to their suitability for each county.
	Site Location
Reports	Wildlife. "Endangered and Threatened Species of the Tennessee-Tombigbee Corridor," prepared by US Department of the Interior, Fish and Wildlife Service, Decatur, Ala.
	Water supply. Phase I and Phase II water supply studies.
	Flood hazard. The 100-year floodplain is delineated from Federal Flood Insurance Maps.
	Wetlands. Wetland types are mapped using a 1:24,000 scale, from the US Fish and Wildlife Service.
	Wildlife resources. Habitats are shown for deer, wild turkey, mussel beds, and colonial nesting birds.
	Soils. General soil types and soil characteristics are mapped for the Corridor area.

1.0 Site Name
2.0 Location
    2.1 River Mile
    2.2 Map Quadrangle
    2.3 County and State
    2.4 Nearest Town or City
        2.4.1 Local
        2.4.2 Regional
    2.5 Exhibits-Location, Topo, Aerial Photo, Oblique Photo
3.0 Labor Market
    3.1 Population
    3.2 Employment Characteristics
    3.3 Commuting Area
4.0 Engineering Considerations
    4.1 Size
    4.2 Access
        4.2.1 Road
        4.2 2 Rail
        4.2.3 Water
        4.2.4 Air
    4.3 Topographic Conditions
        4.3.1 Terrain Features
        4.3.2 Relief
        4.3.3 Predominant Slope
    4.4 Geologic and Seismic Conditions
        4.4.1 Soil Depths and Types
        4.4.2 Bedrock Formations
        4.4.3 Karst Development
        4.4.4 Faulting
        4.4.5 Seismicity
        4.4.6 Mineral Deposits
    4.5 Hydrologic Conditions
        4.5.1 Streamflow Rates
        4.5.2 Flood Levels
        4.5.3 Ground-Water Tables
    4.6 Utilities
        4.6.1 Electricity
        4.6.2 Gas
        4.6.3 Water
        4.6.4 Waste Disposal
            4.6.4.1 Wastewater
            4.6.4.2 Solid Waste
            4.6.4.3 Hazardous Waste
5.0 Environmental Considerations
    5.1 Natural Conditions
        5.1.1 Air Quality
        5.1.2 Water Quality
            5.1.2.1 Surface Water
            5.1.2.2 Ground Water
        5.1.3 Ecological Resources
            5.1.3.1 Fisheries and Aquatic Ecology
            5.1.3.2 Terrestrial Wildlife and Vegetation
            5.1.3.3 Wetlands and Wetlands Wildlife
            5.1.3.4 Threatened and Endangered Species
    5.2 Sociocultural Conditions
        5.2.1 Land Use
        5.2.2 Land Ownership
        5.2.3 Agricultural Resources
        5.2.4 Archaeological, Historical, and Architectural Features
6.0 Studies Conducted
    6.1 Type, Level, Date and Results of Study
    6.2 References

Figure 3. Evaluation outline for industrial site development

SITE NAME: Columbus South SIZE: 1,090 acres

LOCATION

STATE: Mississippi COUNTY: Lowndes
NEAREST: Columbus
DISTANCE & DIRECTION: 4.0 miles north
POPULATION (1980): 27,383
NEAREST METROPOLITAN AREA: Tuscaloosa, Ala.
DISTANCE TO CENTRAL CITY & DIRECTION: 6[illegible] miles ESE
RIVER: Tennessee-Tombigbee Waterway
RESERVOIR: Aliceville Lake MILES: 324.0 L
TOPOGRAPHIC QUADRANGLES: Columbus, Miss. (15')

LABOR MARKET AREA

COUNTIES: Clay Noxubee
Lowndes Oktibbeha
Monroe Pickens (not in region)

POPULATION (1980): 185,501
AVERAGE LABOR FORCE (1982): 78,320
AVERAGE UNEMPLOYMENT RATE (1982): 11.3%
AVERAGE MANUFACTURING WAGE (1980): $12,020

TRANSPORTATION ACCESS	DISTANCE
ROAD	
STATE OR FEDERAL HIGHWAY: S.R. 69	2.1 miles
INTERSTATE INTERCHANGE: I-59	45 miles
RAIL: Burlington Northern	Adjacent
NAVIGATION CHANNEL: Tenn-Tom Waterway	Adjacent (Elev. 136 ft)
AIR	
COMMERCIAL AIRPORT:	
Golden Triangle Regional	17 miles
GENERAL AIRPORT:	
Columbus-Lowndes County	4.4 miles

ZONING: Not zoned

PLANNED USE: Not planned

LAND OWNERSHIP

PERCENTAGE USACE LAND: 0%

Figure 4. Example evaluation of potential industrial site (Continued)

PERCENTAGE OTHER PUBLIC LAND: 0%
PERCENTAGE PRIVATE LAND: 100%
NUMBER OF PRIVATE OWNERS: 28

TOPOGRAPHY

LOWEST ELEVATION: 140 ft HIGHEST ELEVATION: 184 ft
PREDOMINANT TERRAIN: Level (0% - 2% slope)

UTILITIES

ELECTRICITY

NEAREST TRANSMISSION LINES:	DISTANCE	VOLTAGE
Colbert-Columbus Primary	1.6 miles	161 kv
NEAREST SUBSTATIONS:		
Columbus Primary Substation	1.6 miles	161 kv

LOCAL DISTRIBUTOR: Four-County Electric Power Association

NATURAL GAS	DISTANCE	SIZE
NEAREST PIPELINES:	Onsite	36 in.

LOCAL DISTRIBUTOR: Tennessee Gas Transmission Company

WATER

NEAREST LINES:	DISTANCE	SIZE
	2.9 miles	6 in.
NEAREST STORAGE TANK:	5.1 miles	150,000 gal
NEAREST TREATMENT PLANT:	5.8 miles	2.5 MGD excess capacity

LOCAL SUPPLIER: Columbus Light and Water Department

WASTEWATER

NEAREST LINES:	DISTANCE	SIZE
	No data	No data
NEAREST TREATMENT PLANT:	3.7 miles	6.0 MDG excess capacity

TYPE OF TREATMENT: Activated sludge
LOCAL UTILITY: Columbus Light and Water Department

SOLID WASTE

NEAREST DISPOSAL SITE:	DISTANCE
Lowndes County Landfill	3 miles

OPERATOR: Lowndes County
CAPACITY OF SITES WITHIN 30 MILES: 4,304,800 cu yd

Figure 4. (Concluded)

Transportation

Industrial development requires that suitable rail, highway, and possible port or off-channel facilities be provided. Many disposal areas along the waterway have potential, given the siting considerations, for industrial site location. However, they may be inaccessible to vehicular traffic. Only a few railroads are near the Waterway sites. The IDAS provides maps showing the present transportation routes. Development of transportation structures and port or other off-channel dock facilities normally requires significant outlays of public or private funds.

Water supply

Industries vary in their requirements for water. The availability of required water could prevent an industry from locating in an area. The water supply reports summarize available water supply and alternatives for development of water supply systems.

Waste disposal

Facilities require solid waste disposal and, potentially, hazardous waste facilities. Some provision or plans for these facilities are normally required.

PART XI: AQUIFER PROTECTION

The Aquifer as a Resource

Aquifers are water-bearing geologic strata composed of the geologic formation(s) and the ground-water supply (Harris and Ferrell 1982). Examination of the aquifer and aquifer impacts generally requires a broader, regional view of the resource as compared to consideration of ground-water resources, e.g., a city's water supply or a single-residence septic tank field. The State and Federal agencies and programs that deal with the aquifer resource are primarily concerned with documentation of aquifer characteristics, e.g., interconnections, location, and movement of water within the aquifer. Regulations and statutes affecting aquifers relate to ground-water regulation or mineral extraction. That is, the resource is inventoried and documented for utilization, but not regulated as a resource, per se.

Local Planning and Aquifers

Background

Aquifer protection is of concern to local and regional planners because development activities can result in pollutant contamination of the aquifer. Water supply, wastewater treatment, and land use management can affect the aquifer resource and are areas of local and regional planning concern. For many of these studies, planners may use the services of consultants or require other outside expertise. Most of the activities are regulated by State and Federal regulations. Activities that should be considered for aquifer protection purposes are:

a. Ground-water pumping.

b. Surface- and deep-mining activities.

c. Surface-water impoundments.

d. Oil and gas operations, especially brine pits and waste disposal operations.

e. Permitted and abandoned hazardous waste and solid waste sites.

f. Septic tank and drain field units.

Regional Aquifer System
Analysis (RASA) studies

The activities of local planning units affect the conditions of the underlying aquifer. The extent of any aquifer requires that documentation and consideration of impacts be on at least a regionalized basis. To facilitate prediction of localized impacts, the US Geological Survey (USGS) is currently conducting nationwide RASA studies. The two studies that cover the Corridor area are the Southeast Gulf Coastal Plain Sand Aquifer Study and the West Gulf Coast RASA. The RASA studies are composed of documentation of aquifer characteristics and simulation models of the existing hydraulic regime and impacts caused by development. The aquifer characteristics are described in sufficient detail to allow computer simulation of water movement and such effects as land subsidence. The models allow for assessment of conditions with and without pumpage, allowing evaluation of man's activities on the aquifer (Bennett 1979). Use of the models can help provide alternatives for management of ground water (USGS 1983).

The Southeast Gulf Coastal Plain Sand Aquifer Study was begun in 1978, and data collection is complete. Preliminary modeling of the system indicates that stream-aquifer interactions along the major river valleys have a major impact on the hydrodynamics of the aquifer system. Calibration and refinement of the model were scheduled for completion in 1984 (USGS 1983). The West Gulf Coast RASA is in the data collection stage.

Planning and Management Alternatives

Two planning and management alternatives are presented for aquifer protection. The first addresses protection of aquifer quality, specifically, prevention of aquifer contamination. The second addresses aquifer depletion.

Local and regional actions to protect the aquifer resource quality are subsumed under powers to regulate and plan for land use. Many of the activities that affect aquifers are regulated by State and Federal statutes. Protection of the aquifer resource requires, within the authority and resources of the planning, bringing together the relevant pieces of information so that reasoned judgments can be made. The aquifer protection framework presented below brings together the information and information sources required for making decisions for protecting aquifer quality. In addition to this

framework, local or county ordinances can be implemented to regulate activities that affect aquifer contamination. These ordinances are discussed in Part VIII, Ground Water. The second alternative, aquifer management, addresses the issue of aquifer depletion due to overuse of ground-water resources.

Aquifer protection framework

The purpose of this framework is to show how decisions regarding aquifer protection could be made. Decisions on aquifer protection are made as land use choices to protect the aquifer from dewatering and protection of land and ground-water quality. This framework details the information required and the information sources for aquifer protection. The information for the framework includes aquifer characteristics and the information on land use activities required to adequately plan for protection of the ground-water resource.

Land Uses	Aquifer Characteristics
Oil and gas development	Soil
Coal, mines, quarries	Geology
Sand and gravel mining	Hydraulic properties
Hazardous waste	Water supply
Solid waste disposal sites	Impoundments

Land uses. Various land use activities can result in contamination of ground water from pollution resulting from leaching or effluents and dewatering effects. The State regulations pertaining to these land uses normally include requirements for measures to protect the aquifer. The IDAS data layers available from LANDSAT data and the Inventories are listed below.

LANDSAT Data	Environmental Resource Inventories
Land cover	Mineral resources
Agriculture and pasture	Energy
Forest	Aggregate and construction
Forested wetland	Metals
Nonforested wetland	Clay and chalk
Sand and rock	Composite
Urban areas	
Water	

Information regarding these land uses in a particular planning area is available from state agencies (Table 13). Mining activities for minerals such as coal or for iron and construction materials such as shale and clay can result in dewatering and, in some cases, development of sinkholes that provide contaminant pathways. Improper or inadequate management of oil and gas wastes can also cause aquifer contamination. Improper operation or management of solid and hazardous waste disposal sites can also cause leaching of pollutants into soils.

Aquifer characteristics. The structure and hydraulic characteristics of the geologic strata making up the aquifer determine to a large extent the quantity and quality of ground water available from an aquifer. For aquifer protection decisions, information is required on aquifer characteristics, e.g. permeability, geology, soil characteristics, and water-bearing properties. This information is available from the Soil Conservation Service. Agencies responsible for providing assistance and information about aquifer characteristics are listed in Table 14.

Assimilating data on land use activities and aquifer characteristics allows the planner to characterize the aquifer and identify those land use activities that can affect aquifer recharge and aquifer contamination. This inventory and assessment process is readily accomplished using the data sources that have been identified. The IDAS capabilities could be used, for instance, to assimilate maps showing soil characteristics and different land use activities, e.g. oil and gas development. Use of the data in this way can identify planning areas where land use activities should be encouraged, discouraged, or limited. Development of this type of data requires expertise on aquifer and soil characteristics, which is available from the USGS and from state geology and water resource agencies. It may be desirable to keep records or an inventory of all activities, such as oil and gas operations, for which planning agencies may not be heavily involved. Such an ongoing inventory would ensure availability of required data when future land use decisions are made.

When the RASA models are calibrated, the local and regional planner will be better able to utilize the IDAS and other aquifer data. The RASA models are intended to provide the local planner with a framework for detailed local

Table 13

Agencies Responsible for Land Uses Affecting Aquifer Protection

Land Uses	Kentucky	Tennessee	Mississippi	Alabama
Oil and gas development	Kentucky Geological Survey	State Oil and Gas Board	Miss. Oil and Gas Board	State Oil and Gas Board
Coal, mines and quarries	Natural Resources and Environmental Protection Cabinet, Dept. for Surface Mining Regulation and Enforcement	Tennessee Division of Geology	Miss. Bureau of Geology	Geological Survey of Alabama
Sand, gravel, clay and shale	Kentucky Geological Survey	Tennessee Division of Geology	Miss. Bureau of Geology	Geological Survey of Alabama
Hazardous waste sites	Natural Resources and Environmental Protection Cabinet, Division of Waste Management	Division of Solid and Hazardous Waste	Bureau of Pollution Control	Department of Public Health, Division of Solid and Hazardous Waste
Solid waste disposal sites	Natural Resources and Environmental Protection Cabinet, Division of Waste Management	Tenn. Department of Public Health, Division of Environmental Sanitation	Board of Health for Mississippi	Department of Public Health, Division of Solid Waste and Vector Control

Table 14

Agencies Responsible for Aquifer Information

Item	Agency
Soils	Soil Conservation Service, Department of Agriculture
Hydraulic properties	US Geological Survey
	Kentucky Tennessee Mississippi Alabama
Geology	Kentucky Geological Survey
	Tennessee Division of Geology
	Mississippi Bureau of Geology
	Geological Survey of Alabama

planning studies.* The framework can be used by local planners or their consultants for water supply, wastewater, and land use planning. The modeling capabilities of RASA allow the planners to investigate such things as the effects of increased ground-water pumpage and the ground-water quality changes anticipated in the aquifer (Bennett 1979).

Aquifer management alternative

General. The Corridor study areas generally have adequate ground-water sources. These sources are heavily utilized for water supply for municipal, domestic, and industrial use. In some areas ground-water pumpage is close to the aquifer recharge amounts. Growth in an area can cause the use to exceed the recharge capability. Insufficient recharge alone or in combination with aquifer hydraulics can result in dewatering of an aquifer (Harris and Ferrell 1982). Areas undergoing development should account for aquifer depletion and recharge. This problem has been encountered in the Tupelo-Lee County, Mississippi, area. The combined effects of industrial development and urban expansion (overpumpage of ground water) as well as the aquifer characteristics (i.e. ground-water movement within the aquifer system) were projected to cause dewatering of the aquifer by the year 2000. The Tennessee Valley

* Personal Communication, July 1984, Mike Mallory, US Geological Survey, Water Resources Division, Mississippi District.

Authority (TVA) studied the water supply problem and made recommendations for addressing aquifer depletion (Harris and Ferrell 1982). The recommendations from the TVA study are a plan for management of an aquifer for conjunctive use (McArthur and Brammer 1983). Conjunctive use is the use of ground- and surface-water supplies in combination for water supply to relieve the heavy reliance on ground water, thereby protecting the aquifer. The components of this conjunctive use management plan are discussed briefly below. Because of the management and legal issues involved in use of these resources, a study was made of the institutional requirements to implement such an alternative.

TVA recommended plan. The components of the plan recommended by TVA would result in reversing the trend of aquifer depletion. The components of the plan that can readily be implemented or planned by local and regional planners are the Water Conservation Program and Ground-Water Management Plan components (Ferrell and Harris 1982).

a. Water Conservation Program. Well planned and managed water conservation programs can result in substantial long-term water savings. Planners can involve civic and other public organizations in educating the public in conservation practices. Municipal suppliers can install water leak monitoring and detection systems. A number of home water-saving devices are available. Industrial consumption can be decreased through measures such as closed loop cooling systems and use of treated effluent instead of ground water (Ferrell and Harris 1982).

b. Ground-Water Management Plan. Development of a ground-water management plan requires cooperation and coordination among users of ground water. Effective management would likely require some type of State or regional regulation on use and allocation of ground water, which is presently lacking. The institutional arrangements for such action are described in McArthur and Brammer (1983). Lacking institutional changes, a plan can be developed for ground-water management if the severity of aquifer depletion is recognized, such as in Mississippi's "capacity use area" designations. The plan would include proposed restrictions on the pumping of ground water (McArthur and Brammer 1983).

Development of readily available or planned surface-water supplies

When aquifer protection is planned, development of available or planned surface-water supplies should be undertaken. The TVA plan recommended the City of Tupelo develop a reservoir that had been under consideration. The readily available alternate supplies are short-term, interim solutions to water supply shortage problems, but should be implemented along with the long-term plans discussed below (McArthur and Brammer 1983).

Collective action by water systems

Collective action to interconnect adjacent water systems can conceivably alleviate short-term local shortages. Interconnection of the water systems would require construction of facilities such as pipelines for transmission. Some institution or collective entity would have to be formed for the management actions. There may be lack of public support for collective action, but an advantage of collective action is that it produces a water distribution organization capable of contracting with agencies or other water districts for water supply (McArthur and Brammer 1983).

Regional surface water supply development

Development of readily available surface supply sources is important so that the aquifer depletion process can begin to be abated. However, the objective of an aquifer protection plan is the development of alternatives so that the aquifer is not depleted. This, therefore, requires development of surface water for water supply. Regional development of surface-water sources requires planning by regional and perhaps Federal water management agencies. The Waterway is a source of available surface water for water supply; however, it may not supply long-term needs (McArthur and Brammer 1983).

References

Bennett, G. D. 1979. "Regional Ground Water Systems Analysis," Water Spectrum, Vol 11, No. 4, pp 36-42.

Harris, Wiley F., and Ferrell, James W. 1982. "Lee County, Mississippi, Water Supply Study," Report No. WR28-1-580-106, Tennessee Valley Authority, Norris, Tenn.

McArthur, Robert E., and Brammer, Dana B. 1983. "Institutional Framework for Conjunctive Use of Surface and Ground Water in Tupelo-Lee County, Mississippi: Phase II," Technical Completion Report A-137-MS, Water Resources Research Institute, Mississippi State University, Mississippi State, Miss.

US Geological Survey. 1983. "Water Resources Investigations in Mississippi, 1982-1983," Water Resources Division, Mississippi District, Jackson, Miss.

PART XII: RECREATION PLANNING

Introduction

The purpose of recreation planning on a local basis is to assess the recreational needs and desires of a community and design a course of action to meet them. Recreation planning should focus on creating or improving community systems for delivering local recreation services, programs, and activities. As such, the planning process must be viewed as a means of providing local decision makers with viable alternatives for anticipating and successfully responding to public recreation needs.

Recreation planning was not formally incorporated into the Tennessee-Tombigbee Corridor Study or the original scope of work for this report. Therefore, data bases relevant to recreation planning were not developed. Because of this, the guidance provided in this part and the cited data sources are more general in nature than in other parts of this report.

The purpose of this part is to describe a practical approach to community recreation planning within the Tennessee-Tombigbee Corridor and provide supplementary information to assist local planners. The reference to planners ranges from professionally trained planners, to local officials of all types, to ad hoc citizen groups. The description is intended to apply to municipalities that have well-established recreation delivery systems as well as to those that have none. The basic planning process is the same for all situations. Fundamentally, the only thing that varies is the level of recreation services already in existence, and the availability of local financial resources to support them.

Planning Guidance

Planning versus plans

In being responsive to a community's recreation needs, it is important that everyone understand the distinction between "planning" and "plans." The most effective way of meeting local recreation desires is to view and implement planning as a never-ending, continuous process. A "plan" is correctly viewed as a document that communicates the existing status of the planning process at any one point in time. Too often, the presence of a colorful and

attractive plan or planning document is mistaken for an effective planning process. Unfortunately, these so-called "plans" are often the ones that merely collect dust on some public bookshelf, thus serving no good purpose. After a plan is produced it must be periodically updated, preferably at least annually.

Need for a plan

Local officials must be careful about their preconceptions concerning the type of recreation plan or course of action needed for their community. The words "recreation plan" are traditionally used with reference to two types of plans. Recreation site plans pertain to architectural drawings and renderings for development or construction of a specific recreation area or facility such as a park or a softball complex. The term recreation master plans most commonly refers to a support document pertaining to a thorough analysis and prioritization of all recreation needs of a community. Appendix A (page 100) outlines the contents of a typical recreation master plan. A master plan is usually characterized by a recommended capital improvements program that outlines a course of action for acquiring and/or developing areas and facilities over a 10- to 20-year period. A park and recreation master plan may exist in several forms. The master plan may be a separate document labeled as such. It may also be a section or a chapter of a municipality's comprehensive plan pertaining to further development of all municipal functions such as streets and sewers, police and fire protection, and public education. Regardless of the form in which the master plan exists, it must not be developed or maintained in a vacuum, independent of other municipal functions. For maximum effectiveness, planning for the provision of parks and recreation and leisure services must be coordinated with the provision of other essential services.

Community officials sometimes proceed to the formulation of site plans or recreation master plans without being certain what plan is needed the most. Early attention should be given to the type of plan or course of action that is needed, particularly for communities that currently have recreation delivery systems. For example, what may be perceived as a need for more areas and facilities may actually represent a need to upgrade, repair, or expand existing areas or facilities. The need for additional recreation staff or improved programming and scheduling may likewise be incorrectly perceived as a need for more facilities. The main point here is that local officials should be sure

whether additions to or modifications of the existing system are most appropriate. This recognizes that some situations may warrant both additions and modifications.

Complexity of planning

To be carried out properly, recreation planning involves a series of well-coordinated efforts including significant levels of research, communications, and organization of local resources. This task requires professional training and experience in the field of recreation. Over the years there has evolved what is commonly referred to as the "cardinal rule of recreation planning," which, simply stated, is "plan with and not for people." Interpreted, this means that the only effective way to plan for people's recreation is to involve them directly in the planning process. There is no substitute for this, and it is absolutely necessary for successful planning. There is no single individual who has sufficient personal insight to a community's recreation desires and interests to prescribe programs and facilities. A well-trained recreation professional knows that the only way of accurately assessing people's leisure desires is to ask them directly through carefully constructed surveys or other valid and reliable means.

Another matter that deserves attention in the planning process pertains to a principle of planning which states, "function determines form." Restated in simpler terms, this means that the intended uses of a facility or area should be the foremost consideration in determining its design and construction. Too often, design and construction errors are committed when insufficient forethought has been given to intended and potential uses of facilities. Considering acquisition and construction costs today, communities cannot afford mistakes of this nature. To preclude this from happening, a clear understanding must be reached pertaining to the activities, programs, services, and events to be conducted in an area or facility. Secondly, planners should involve in area and facility planning those individuals who will eventually be responsible for planning, organizing, and conducting the recreational services and activities. It is also useful to involve in the planning process the people who will maintain the area or facility. Many maintenance obstacles can be avoided if park maintenance personnel are involved in the planning and design of parks.

Guidance for Communities That Have No Recreation Facilities

Given that there are a number of small rural communities in the Tennessee-Tombigbee Corridor that have no recreation facilities or programs, there is a need for planning processes to help overcome this situation. Such communities should begin by forming a recreation planning committee composed of a cross section of community leaders and ordinary citizens. The purpose of the committee should be to (a) seek sources of qualified planning assistance, (b) function as a focal point for prioritizing local recreation desires, (c) identify alternative means of fulfilling these needs, and (d) play a central role in acquiring the necessary financial resources or making appropriate arrangements for fulfilling recreation needs.

The Planning Process

There has traditionally been agreement that recreation planning involves a number of interrelated steps that are usually organized into five stages (Gold 1973, Bannon 1976). These stages consist of: (a) survey and analysis, (b) goal formulation, (c) development of alternatives, (d) implementation, and (e) review and analysis. However, this represents a condensed model of a somewhat more complicated process. Figure 5 presents a more realistic view of the intricacies of effective recreation planning. One should bear in mind that successful recreation planning can be improved by a flexible, dynamic approach and should not be viewed in a strict "cookbook" manner. Successful completion of one step or stage in the planning process does not necessarily ensure success at the next step, and so on. Hunt and Brooks (1983) explain the necessity for evaluating the quality and effectiveness of the products of each step during planning.

While the planning process obviously needs to be structured, it must also be flexible enough to be responsive to changing conditions. In particular, the emphasis on implementing a plan should not be reserved or withheld for the latter portion of the planning process. Implementation is in reality integral to the entire planning process, instead of a separate and distinct step or stage coming at the end. Successful planning depends as much on the events, factors, and circumstances that arise during the planning process as events subsequent to plan preparation. It has been shown, for example

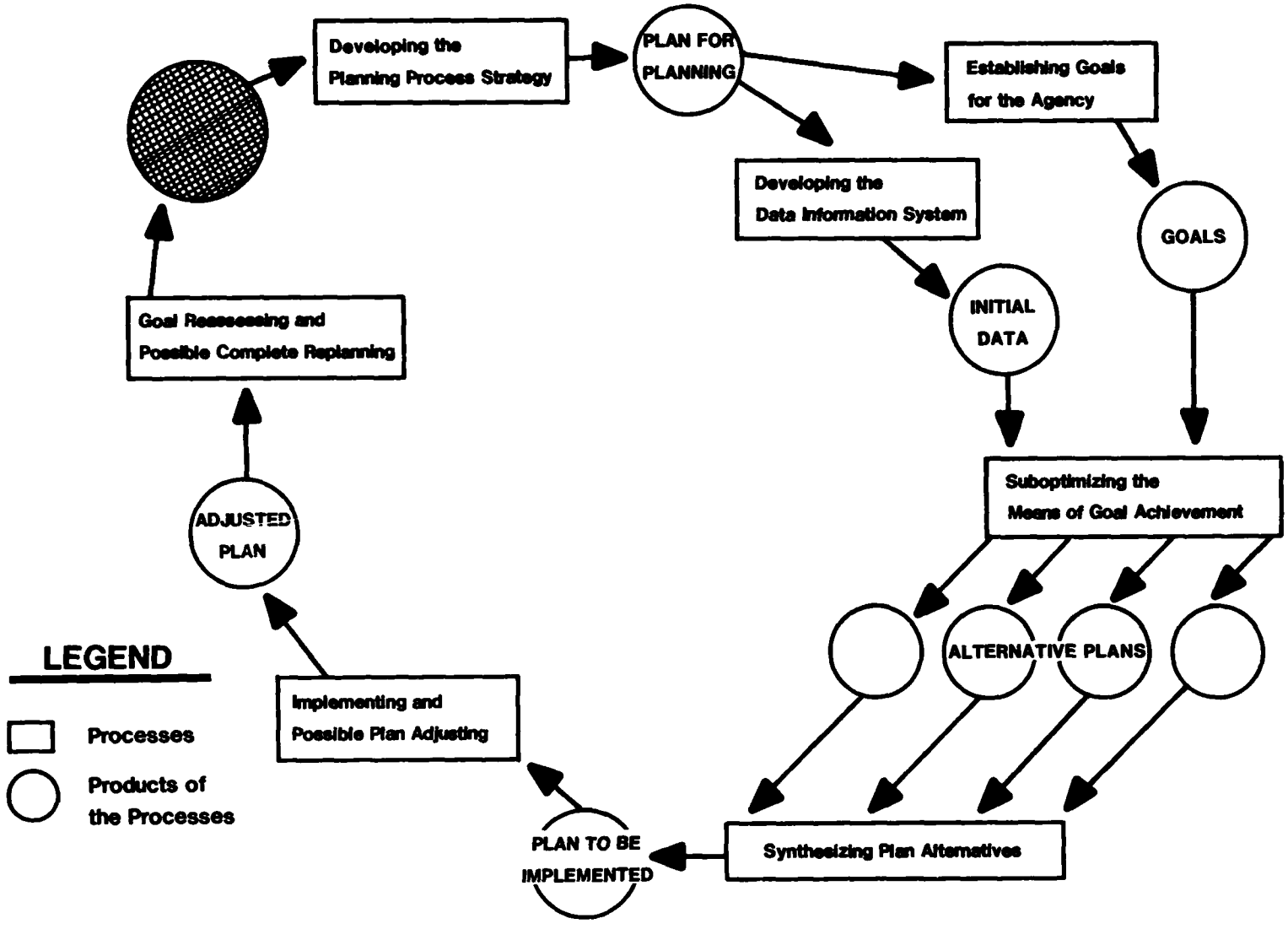


Figure 5. Regional Recreational Planning Model (adapted from Hunt and Brooks 1983)

(Bumgardner 1974), that successful planning results are dependent on: (a) deviation from plans, (b) successful strategies, (c) news media views, (d) facilitating laws, (e) commitments from public officials, and (f) existence of capital improvement programs. Attention should therefore be directed toward these and other locally important variables during plan preparation, rather than afterward as is too often the case.

In addition to understanding the overall theoretical aspects of planning, it is necessary to understand the usual component features of local recreation planning. Therefore, with reference to the Regional Recreational Planning Model illustrated in Figure 5, the remainder of this discussion on the planning process focuses on further details and specific sources of information.

Development of planning process strategy

The initial phase of recreation planning is critically important in that it sets the stage for everything that follows. As reported by Hunt and Brooks (1983), this is the point where (a) end products of the planning endeavor are clearly identified, and (b) detailed resources, personnel, finances, and time required for the total planning process are outlined.

It would be appropriate during this phase to consider earlier suggestions made herein about the need for a plan. The type, scope, and form of recreation plan are matters deserving serious attention. This will, of course, depend on many things, but perhaps most significant is the existing level of recreation services. Care should also be taken in the initial planning stages in making prejudgments about additional needs, e.g., facilities, personnel, programs, repairs. Although accurate prejudgments can be valuable, they can be difficult to make or misleading where there are multiple needs, particularly in existing delivery systems.

If there is one mistake that is especially important to avoid during this phase, it is underestimating the amount of resources to initiate a planning process and prepare a plan. Recreation planning is a time consuming and sometimes costly endeavor. Given this situation, and depending on the availability of local planning assistance, it is highly advisable to acquire all of the outside assistance that can be obtained.

Use of planning assistance

Numerous sources of recreation planning assistance are available to communities. Some of the more important sources are described below; addresses

of individuals and agencies that can provide recreation planning data and assistance are provided in Appendix B (pages 101-104).

Cooperative Extension Service, US Department of Agriculture. This agency commonly has recreation specialists knowledgeable of planning. Offices are located at major universities within each state. The contacts applicable to the Tennessee-Tombigbee Corridor are listed in Appendix B.

Planning and development districts. Planning and development districts specialize in planning and rendering planning assistance of all types. Many of them have regional, county, and local recreation plans on file. In addition they are a good source of socioeconomic, demographic, and other types of useful information. The regional planning agencies participating in the Corridor Study should be contacted for this information.

Private consulting firms. The Council of Park and Recreation Consultants is an affiliate of the National Recreation and Park Association. The council is composed of experienced professional planners that have helped many communities with planning. A listing of Council members is contained in Appendix B.

University park and recreation departments. In each of the four states within the Tennessee-Tombigbee Corridor there exist one or more colleges or universities that have park and recreation curricula. Such programs commonly offer various planning services to communities through arrangements such as student class projects and faculty or departmental consulting. Appendix B identifies universities that offer park and recreation curricula and are members of the National Recreation and Park Association.

National Recreation and Park Association (NRPA). The NRPA, a nonprofit organization, and its regional offices are sources of a variety of planning assistance. Primarily, these sources provide reference material and guidance in obtaining information and technical services. Appendix B identifies two sources.

State planning and grant agencies. Each of the states in the Tennessee-Tombigbee Corridor has an office that administers recreation and parks-related grant programs (Appendix B). These offices also provide varying levels of planning and technical services to local communities, particularly those that are applying for grants.

If it is anticipated that a particular grant will be sought, such as a Land and Water Conservation Grant, State guidelines should be obtained during

the planning process strategy phase. Most grant recipient qualifications contain specific planning requirements that must be met. For example, in compliance with Office of Management and Budget Circular No. A-95, every application for Federal funding is to be reviewed by other State agencies. To initiate this clearinghouse process, the applicant for Federal funding applies to the State Clearinghouse for Federal Programs and also the Regional Clearinghouse, which is usually the local planning and development district. Much time, money, and wasted effort can be saved by early consideration of the planning requirements associated with different grants administered by these offices.

Goal formulation

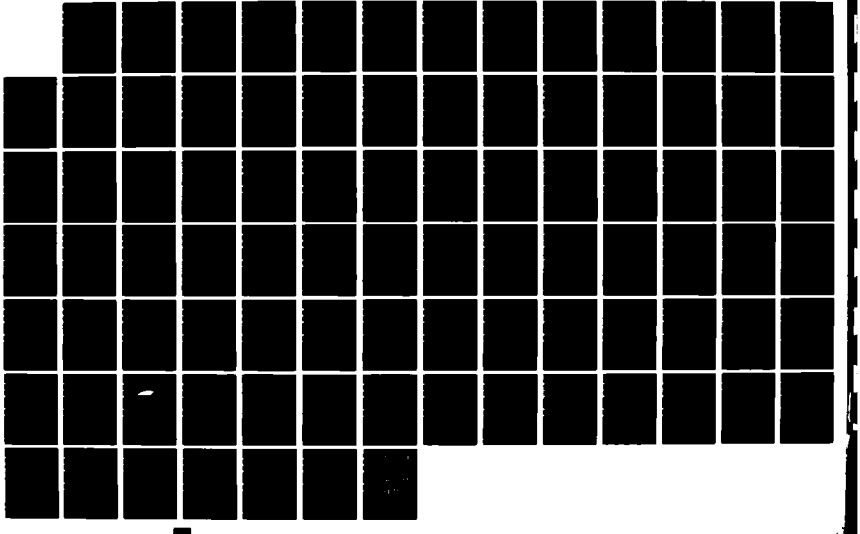
Goals are long-range levels of achievement desired through the provision of parks, recreation, leisure services, and other related amenities. This process is a vitally important step in recreation planning. Unfortunately, mistakes in goal formulation are often undetectable until years into the implementation of plans. Goal formulation is an important factor to be given adequate consideration early in planning. Anyone involved in goal formulation should review "Goals That Count" (Gold 1974), available from the NRPA. Most universities that have park and recreation curricula should have a copy in their library. The biggest problem with goal formulation is the tendency to confuse goals with objectives. There is a distinct difference that must be clearly understood for effective planning. Appendix C (pages 105-106) contains example goals and objectives statements extracted from a typical recreation master plan.

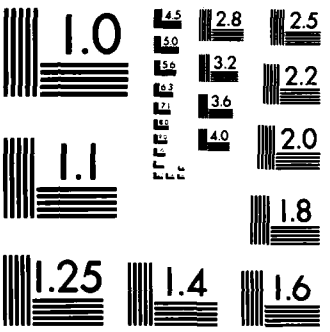
Collection of planning data and information

Several different types of data and information are required for long-range planning. Following is a description of the most commonly needed types. However, planners should first check with approval or funding agencies, such as state planning and grants offices, to ensure that all the necessary data and information are obtained during the planning process.

Inventory of existing areas, facilities, programs, and activities. This step is undertaken to determine what is available within the municipality and surrounding area. It should include both public and private provisions. An important factor in conducting a useful inventory is recording the inventory in correct units of measurement. Several sources of information may be useful in this regard. National, state, and local park and recreation planning

AD-A164 307 ENVIRONMENTAL PLANNING AND MANAGEMENT ALTERNATIVES FOR 2/2
THE TENNESSEE-TOMB (U) ARMY ENGINEER WATERWAYS
EXPRRIMENT STATION VICKSBURG MS ENVIR
UNCLASSIFIED J E HENDERSON ET AL OCT 85 WES/MP/EL-85-5 F/G 13/2 NL





standards reveal commonly used units of measurement. Statewide Comprehensive Outdoor Recreation Plans (SCORPs) are another source. State planning and grant offices may also provide this information.

Inventory of potential resources. This step is undertaken to determine what additional areas and facilities might be acquired or made available for future use. Using correct units of measurement is also important here.

Analysis of population, profile, socioeconomic, and demographic characteristics. The US Census Bureau is a commonly used source of this type of information. SCORPs sometime contain this information. University geography departments, local chambers of commerce, and public libraries should also be checked. The agencies listed in the last section of Appendix B also specialize in providing this information.

The US Army Engineer District, Mobile, maintains relevant data for counties within the Tennessee-Tombigbee Corridor. Data from the Economic Impact Assessment Model provide population projections and demographic information, e.g., age class population projections, for the counties in the corridor.

Identification of local recreation needs

Surveys. Probably the best way to determine people's desires for parks, recreation, and leisure services is to ask them. This process is commonly carried out through the use of surveys and other types of citizen input. Completion of usable, i.e., valid and reliable, surveys is a task requiring research and statistical skills; professional expertise is advisable. Normally, it is expedient to use survey instruments that have already been tested and successfully used, rather than developing a new one for every occasion. There are plenty of existing survey instruments that need only slight modification or adaptation to local information-gathering requirements. A good source of information on how to conduct a recreation needs assessment is a publication titled "Needs Assessment: Taking the Pulse of the Public Recreation Client," available for $3.50 per copy from the Texas Agricultural Extension Service, Texas A&M University, College Station, Texas 77843 (Crompton 1983).

The best source of existing information on recreational needs is contained in the SCORPs of each state. These plans contain supply and demand data, usually obtained through surveys, on a statewide basis that can provide insight to local needs. At this writing, each of the four relevant SCORPs was being updated with new information. Refer to Appendix B (State Planning and

Grants Agencies) for the addresses of state agencies that have SCORP information.

Public meetings. In addition to conducting surveys as a means of determining leisure needs, public meetings can also provide useful information. The advantage of a public meeting over a survey is the opportunity for people to interact and discuss local needs. A disadvantage in holding public meetings is the difficulty in overcoming citizen apathy toward planning and the relative importance of leisure services. Success in holding public meetings requires skillful publicity and promotion.

Application of planning standards

The use of park, recreation, and open-space planning standards has long been a recognized practice in determining the adequacy of local areas and facilities. Nevertheless, professional views differ on the applicability of so-called "national standards" to all communities. Attempts at literal application of national standards discount the fact that no two communities are alike and financial capabilities vary greatly.

There is a growing consensus that local communities are best advised to develop their own standards. Standards relate to needs assessment not by measuring needs, but by relating needs to minimum or optimum units of areas and facilities to adequately meet defined or expressed community needs. Planners may obtain further information about developing and using standards from the following sources.

SCORPs often contain standards that are recommended for statewide use. For instance, Mississippi's 1985 SCORP will contain an illustrated description of how to develop and apply standards at the local level.

The NRPA publication Recreation, Park, and Open Space Standards and Guidelines (NRPA 1983) is a source of information on standards.

Needs analysis

Once recreation needs have been identified through surveys, public meetings, and application of planning standards, the analysis entails interpretation of accumulated information. The objective of needs analysis is the determination of unmet needs that exist and interpretation of the needs in terms of additional requirements for land, facilities, or recreation programs.

Preliminary analysis of needs information can provide varying insights to unmet needs. For instance, the application of planning standards results

in rather simple numerical indications of area and facility deficiencies or surpluses. Surveys yield statistical findings about public opinions and about participation, patterns, and preferences for recreational activities. Public meetings provide opportunities for dialogue, discussion, and the exchange of ideas. SCORP data, traditionally focusing on supply and demand, provide insight to local needs in a statewide context. The point here is that none of these resources analyzed singularly is likely to provide conclusive details about unmet needs. To be effective, needs analysis requires comparative analysis and assessment of all of these sources of information. The job of the planner or analyst is to look for areas of consistency, supporting relationships, and obvious conclusions from the information. The analysis should, as a minimum, result in a listing of priority needs and supporting justification. This, then, provides the basis for consideration of alternative ways to fulfill the unmet needs and ultimately provides the basis for policy decisions on appropriate courses of action.

Suboptimization of the
means of goal achievement

This phase of the planning process pertains to the generation of alternatives for achieving previously identified goals. Hunt and Brooks (1983) offer valuable guidance to personnel involved in the generation of alternatives by making the following suggestions. Information about past performance, the current situation, and the future is essential in helping to identify alternative courses of action and to evaluate them properly. Types of past information to be collected include the following: success of recreation programs, budget allocations, funding capabilities, and public relations. Information about the current situation, in addition, would include such matters as employee skills, competition, opportunities for cooperation with other local groups, interests of participants, and the local image of the public recreation department. Data about the future would include forecasts of selected economic trends, population demographics, and the availability of Government funding.

While weighing and considering these factors, the task at hand is to identify alternative approaches for fulfilling unmet recreation needs. At this juncture in the planning process it is important to realize that the means of leisure services delivery used in the past is not necessarily the best avenue for the future. More specifically, communities have historically

responded to meeting local recreation needs by playing a "direct provider role." Areas, facilities, and programs have been funded through revenues derived from local property taxes. This approach appears to be a less viable alternative for meeting local needs than in the past. The competition for tax revenues to support more essential public services such as police and fire protection and public education necessitates the widest possible consideration of alternative resources for fulfilling unmet recreational needs. The following discussion by no means includes all of the possible sources that should be carefully evaluated; rather, it is illustrative of feasible options.

Local public facilities. Nearly every local public facility should be considered as a possible facility to house recreation programs. One of the most likely, yet most underutilized facilities, is the public school. Public schools, with their associated recreation facilities, can very effectively meet community recreation needs. Therefore, they should be given priority attention.

Cooperative public agency efforts. Communities, suburbs, and unincorporated areas are increasingly pooling their efforts to meet local recreation needs. Consideration should also be given to joint projects between dissimilar as well as similar public agencies. For example, it is feasible in some instances for county and city, or county and state, agencies to work toward fulfillment of local recreational needs. Local agencies can also sometimes secure direct assistance from Federal agencies in developing multipurpose recreation facilities.

Involvement with private enterprise. In some cases, dependence on private enterprise may be the best alternative means of meeting local needs. There are numerous possibilities for cooperative ventures between public and private enterprise. A good place to start in considering these possibilities is by ascertaining what the local community possesses, such as land, tax incentives, borrowing power, etc., that may be desired by a private entrepreneur. Similarly, it would be useful to consider what the private entrepreneur can do for the community that the community cannot do for itself, or perhaps cannot do as well.

Communities, particular the small communities, must consider and actively pursue every possible alternative to direct providership of programs and facilities. This will require changes in attitudes such as foregoing or relinquishing local pride of ownership and control. It may also mean that

some individuals in the public will choose not to pay the price required to participate. Obviously, efforts should be undertaken to minimize individual exclusion from community recreation programs and activities due to financial limitations.

Synthesis of Plan Alternatives

Evaluation

At this point in the planning process choices have to be made, decision makers have to come to grips with all of the information and recommendations provided to them, and decisions are made on what will be done. Synthesizing alternatives involves selection of alternative courses of action. As such, it may mean choosing all or parts of one alternative and combining it with others. Therefore, it is possible that additional or better alternatives will emerge from the synthesizing process.

Funding

Ultimately the evaluation and synthesis of alternative courses of action reduces to a question of the sources and availability of funds. Although it is impossible to provide all of the information here that is needed to pursue alternative sources of funding, the following may help in getting started. For further information, contact the appropriate state planning and grants agencies listed in Appendix B.

Land and Water Conservation Funds (LWCF). These are Federal funds made available through state planning and grant agencies. The funds can be used for acquisition and development of outdoor recreation areas and facilities. Made available on a 50:50 Federal-local matching basis, these funds are awarded to communities through an open selection process. Since there are specific requirements that must be met to be awarded a LWCF grant, local officials should obtain this information from the state early in the planning process.

General revenue sharing. General revenue sharing funds are monies returned annually to local municipal governments by the Federal Government. These funds my be used for capital improvements and operations and maintenance of local recreation programs. Use of revenue sharing funds to support recreation is a local decision.

Community Development Block Grant Program (CDBG). Although the primary

intent of the Federal CDBG program is not assistance with local recreation needs, its funds can be used for that purpose. Those funds used for recreation are primarily for acquisition and development programs. CDBG funds cannot be used for operations and maintenance activities. A little-known feature of CDBG funds is that they can be used as the local matching share of LWCF grants resulting in 100-percent Federal funding.

Urban Park and Recreation Recovery Program. These Federal funds are available to selected communities for various improvements to recreation systems that are generally not provided under the previously listed programs. For example, these funds can be used for renovation, repair, and maintenance of areas and facilities. They can also be used to support planning and development programs, as well as various innovative programs.

Public Law 89-72 reservoir projects. PL 89-72 enables Federal funds to be used in the construction of recreation projects along Federal waterways such as the Tennessee-Tombigbee. Funds can be made available to localities on a cost-sharing basis. The Corps of Engineers should be contacted for further information about these funds.

The Federal funding programs briefly described here should by no means be considered the limit to available sources. These are some of the important traditional sources, and other alternatives exist. An excellent book Financing, Managing, and Marketing Recreation and Park Resources, by Howard and Crompton (1980), describes additional sources of information.

Implementation with Possible Plan Adjustment

In the traditional sense, plan implementation refers to putting the plan into effect. As discussed earlier, this is a simplification of reality. Nevertheless, to the extent that plans require approval by legislative bodies and public officials, there are political and other considerations which may require adjustments to the plans before financial commitments can be incurred and public funds can be expended. Timing is an important factor to consider in carrying out plans. Political situations can have significant effects on even the best plans. Changes at the Federal, state, and local level can influence the availability of funding for recreational support. Suffice it to say that there are numerous unforeseeable circumstances that necessitate plan adjustments. The important concept is that planners should not get locked

into a particular option with no room for adjustment. Planning must remain flexible throughout for maximum effectiveness.

Goal Reassessment with Possible Complete Replanning

Given that goals guide the planning process, they may be periodically reassessed to ensure that they are keeping the process on the correct course. Goals may change as a result of local circumstances or may require further refinement as priorities change. If local planning goals change, for whatever reason, the planning process may need to be partially or totally repeated. For example, if enhancement of local tourism were not an initial goal, and it subsequently emerged as a priority, portions of a plan may need to be revised. At the very least, this goal would need incorporation into the continuing planning process.

References

Bannon, Joseph J. 1976. Leisure Resources: Its Comprehensive Planning, Prentice-Hall, Inc., Englewood Cliffs, N. J.

Bumgardner, Walter H. 1974. "A Nationwide Survey on the Implementation of Park and Recreation Master Plans," Ph. D. Dissertation, Texas A&M University (University Microfilms, University of Michigan, Ann Arbor).

Crompton, John L. 1983. "Needs Assessment: Taking the Pulse of the Public Recreation Client," Publication No. B-1449, Texas Agricultural Extension Service, Texas A&M University, College Station, Tex.

Gold, Seymour M. 1974. "Goals That Count," Park and Recreation, Vol IX, No. 1, pp 60-65, National Recreation and Park Association, Alexandria, Va.

_____. 1973. Urban Recreation Planning, Lea & Febiger, Philadelphia, Pa.

Howard, Dennis R., and Crompton, John L. 1980. Financing, Managing, and Marketing Recreation and Park Resources, Wm. C. Brown Company Publishers, Dubuque, Iowa.

Hunt, Sharon L., and Brooks, Kenneth W. 1983. "A Planning Model for Public Recreation Agencies," Journal of Leisure Research, Vol 1, No. 2, pp 1-12.

National Recreation and Park Association. 1983. Recreation, Park, and Open Space Standards and Guidelines, Alexandria, Va.

APPENDIX A: TABLE OF CONTENTS FOR A MASTER PLAN*

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* SOURCE: City of Greensboro, N.C., Planning Department. 1971 (Aug). "Greensboro Parks and Recreation," page iv.

APPENDIX B: SOURCES OF RECREATION PLANNING ASSISTANCE AND INFORMATION

Cooperative Extension Service Contacts

Mississippi

Dr. Bob T. Chapin
Coordinator, Land Use Center
Mississippi Cooperative Extension Service
PO Box 5405
Mississippi State, MS 39762

Alabama

Mr. Robert R. Clark
CRD Recreation-Tourism Specialist
Alabama Cooperative Extension Service
Extension Cottage
Auburn University
Auburn, AL 36849

Tennessee

Mr. George F. Smith
Associate Professor
Tennessee Agricultural Extension Service
PO Box 1071
University of Tennessee
Knoxville, TN 37901

Kentucky

Mr. John A. Baxter
Recreation and Tourism Specialist
Department of Forestry
University of Kentucky
Lexington, KY 40546

Council of Park and Recreation Consultants, Inc.
(Past and Present Members)

Stewart E. Allen
Allen Organization
Dept. of Rist-Frost, Assoc.
21 Bay St.
Glen Falls, NY 12801

Ramsis W. Baghose
Associates in Planning & Development Consulting, Inc.
419 No. Bradford (Box 1555)
St. Louis, MO 63105

Eldridge Lovelace
Harland Bartholomew & Assoc.
Recreation Consultants, Inc.
PO Box 307
Spring House, PA 19477

Paul Fjare
Brauer & Assoc., Ltd., Inc.
7901 Flying Cloud Drive
Eden Prairie, ME 55344

Archie Hardy
Archie Hardy & Associates
6949-B N. Trenholm Road
Columbia, SC 29206

Sam L. Huddleston
Sam L. Huddleston & Assoc.
180 Cook Street
Denver, CO 80206

George R. Kemp
The Kemp Group
PO Box 105
Livingston, NJ 07039

Claude Rogers
McFadzean & Everly, Ltd.
209 S. Main St.
Mt. Prospect, IL 60056

Robert Bignold
The ORB Organization
Evergreen Building, Suite 510
Renton, WA 98055

Harry Koca
Ralph Burke Assoc.
1550 Northwest Highway, Suite 400
Park Ridge, IL 60068

Warren P. Cooley
EDCON
2239 Townsgate Rd., Suite 203
Thousand Oaks, CA 91361

Economics Research Associates
10960 Wilshire Boulevard
Los Angeles, CA 90024

Augustine D. Stasi
Edwards and Kelcey, Inc.
70 South Orange Avenue
Livingston, NJ 07039

Gardner Gidley
Gardner Gidley & Associates
144B Reynolda Village
Winston-Salem, NC 27106

Charles M. Graves
The Charles M. Graves Organization
PO Box 7004
Atlanta, GA 30357

Shinji Nakagawa
Peridian Group
17848 Sky Park Boulevard
Irvine, CA 92714

Ronald F. Paige
Recreation Systems, Inc.
2500 East Nutwood Avenue,
Suite 210
Fullerton, CA 92631

Charles R. Spears
Revenue Consultants, Inc.
1000 S. Federal Hwy., Suite 201
Ft. Lauderdale, FL 33316

Gene Schrickel, Jr.
Schrickel, Rollins & Assoc., Inc.
604 Avenue H East
Arlington, TX 76011

Johannes H. Wagner
Storch Associates/Engineers
Two Charlesgate West
Boston, MA 02215

University Park and Recreation Departments

Mississippi
Dr. L. Charles Burchell, Chairman
Department of Recreation
University of Southern Mississippi
Southern Station - PO Box 5123
Hattiesburg, MS 39406-5123

Alabama
Dr. H. T. Ford, Associate Professor
and Director
Recreation Administration Program Area
Department of Health, Physical
Education and Recreation
Auburn University
Auburn, AL 36830

Kentucky
Dr. James C. McChesney,
Chairperson
Department of Recreation and Park
Administration
Eastern Kentucky University
Richmond, KY 40475

Dr. L. Leon Garrett, Professor
and Chairman
Department of Health, Physical
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Carl William Pharis
Recreation Leadership Curriculum Coordinator
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Dr. Don Deaton, Assistant Professor and Coordinator
Leisure Services - Department of Health Physical Education and Leisure Services
307 University Boulevard
University of Alabama
Mobile, AL 36688

Tennessee

Dr. Gene Hayes, Professor and Chairman
Division of Recreation
The University of Tennessee, Knoxville
1914 Andy Holt Avenue
Knoxville, TN 37916

National Recreation and Park Association Contacts

Mr. John Davis, Executive Director
National Recreation and Park Association
3101 Park Center Drive
Alexandria, VA 22302

Mr. Tom Martin, Regional Director
4319 Covington Highway
Room 209
Decatur, GA 30035

State Planning and Grants Agencies

Mississippi

Mr. Jimmy Graves
Mississippi Department of Natural Resources
Bureau of Recreation and Parks
Outdoor Recreation Grants Division
PO Box 10600
Jackson, MS 39209

Alabama

Ms. Linda Clackler
Recreation Planning and Grants Programs Section
Department of Conservation and Natural Resources
64 North Union Street
Montgomery, AL 36130

Tennessee

Ms. Joyce Hayle, Recreation Planner
State of Tennessee
Department of Conservation
Recreation Services Director
701 Broadway
Nashville, TN 37219-5237

Kentucky

Mr. Jim Barker
Office of the Governor
Department of Local Government
Capital Plaza Tower
Frankfort, KY 40601

Sources of Socioeconomic Demographic Data

Mississippi

Mississippi Research and Development Center
3825 Ridgewood Road
Jackson, MS 39211-6453

Alabama

US Army Engineer District, Mobile
Automatic Data Processing
PO Box 2288
Mobile, AL 36628-0001

Alabama (Concluded)
Center for Business and Economic Research
University of Alabama
PO Box AK
University of Alabama
Tuscaloosa, AL 35486

APPENDIX C: EXAMPLE GOALS AND OBJECTIVES*

This plan is a combination of elements, intended to bring to bear various forces and methods that focus on one goal: the provision of recreational opportunities to meet existing and anticipated needs by preserving, managing, and developing recreational and environmental resources. In addition, there are specific goals that are applicable to the parks and recreation system as a whole, as well as to individual projects. These goals are identified briefly as follows:

a. Sufficiency. Sufficient recreation resources are needed, now and in the future, to ensure that enough park and recreation facilities are available to meet the demand.

b. Equality and opportunity. In a democratic society such as ours, all citizens are entitled to equal treatment by government; this includes consideration of groups and classes as well as individuals. Sometimes expressed as the need to provide distributive justice, it involves, in this case, the equitable distribution of resources so that suitable recreational opportunities are available to everyone--to those who prefer active recreation, to those who prefer passive pursuits, and to persons with or without transportation--regardless of economic or social status.

c. Variety. There should be a variety and choice of recreation areas and opportunities, in terms of geography and physiography, so that experiences are available in diverse natural settings; in terms of the recreational activities offered at different recreation sites; and in terms of the type of recreation outing (weekday or weekend).

d. Accessibility. Recreation areas and facilities should be located on or connected with adequate roads, so that they may be reached with safety and relative ease, and convenient to their user population, given their recreation function.

e. Availability. Recreational opportunities should be available on a relatively equal basis to the population classified in various ways. That is, recreational opportunities should account for the tastes of both sexes and various age groups and should provide for families at various income levels as well as for white and nonwhite groups. This means that an acceptable level of recreation facilities should be provided for those unable to pay user fees or charges or incur the costs of transportation.

The primary purpose of this plan is to provide a framework for park and recreation decision making. It is intended to serve as a reference source for various planning commissions and departments, to identify major problems, to

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* SOURCE: City of Greensboro, N.C., Planning Department. 1971 (Aug). "Parks and Recreation," pp 3-4.

analyze and synthesize available data, to suggest policy and operational changes, and to present a program for acquisition and development. It is also intended to express concern over the city's dwindling open space and to urge preventive and corrective action before Greensboro reproduces all the horrors of other cities.

Detailed objectives are to:

a. Inventory existing city-owned or -operated park and recreation areas and facilities.

b. Identify recreation resource problems and also potentials for greater recreational opportunities.

c. Assess current recreational needs and project these in terms of acreage, facility, and activity demands through the decade of the 1970s and early 1980s.

d. Define responsibilities and administrative relationships, suggest areas of cooperation, and promote the coordination of public recreation efforts.

e. List major Federal and State grants-in-aid programs available for recreation purposes.

f. Explain and suggest types of legislation necessary to acquire, develop, and operate recreation areas.

g. Suggest policy and operational changes conducive to the functioning of the parks and recreation program.

h. Suggest a long-range plan for acquisition and development.

PART XIII: WILDLIFE AND WILDLAND RESOURCES

The wildlife and wildland resources of the Tennessee-Tombigbee Corridor are important assets that have much inherent and potential value. These resources include: game and nongame animals; rare, threatened, and endangered plants and animals; and unique environmental features (unique plant communities, natural free-flowing streams, bluffs and caves, etc.). These resources have value and/or provide benefits in several ways. Some of these values and benefits are: natural functions, e.g., floodwater storage and sediment trapping in wetlands; recreation, e.g., sport hunting, birdwatching, etc.; aesthetics; economics, e.g., leasing hunting rights; and research and educational value.

Wildlife and wildland resources are products of the land, and the spatial or geographic dimension is an important aspect to consider in managing these resources. In many cases, these resources are features found in the "odd corners," i.e., those lands too rugged, remote, or wet to readily support farming, forestry, or urban and industrial uses. Many of these resources, e.g., rare, threatened, and endangered species, are confined to these areas and literally depend on the area's continued existence for their survival. Other resources, e.g., game and most nongame animals, are more widespread; however, these resources also ultimately depend on the land and are influenced by the prevailing land uses.

Wildlife and wildland resources can be thought of as a system having three parts: (a) the land and the resultant habitats, i.e., particular combinations of physical and biological features, (b) the plant and animal populations occupying these habitats, and (c) man and his uses of both habitats and populations (Giles 1978). Although much remains to be learned, the basic information concerning the biology and management of habitats and populations is reasonably adequate. However, as one would expect, man is the critical factor in the system. The preferences and expectations of the public strongly influence management of the wildlife and wildland resources of the region. It is therefore necessary to understand the current management framework and to determine the public's needs and preferences in order to translate these into reasonable and responsible management programs.

The responsibility for managing wildlife and wildland resources is shared by the Federal Government, the State governments, and individual

landowners. Wildlife species are considered to be owned by the States and are held in trust for the public. Game animals may become the legal property of individuals when those animals are harvested in accordance with specified regulations. The Federal Government imposes various restrictions on the taking of migratory birds and the disturbance of threatened and endangered species and their habitats. State governments exclusively regulate the harvest of their resident species and establish regulations for taking migratory birds within the overall Federal guidelines. Some States have given legal, protected status to rare, threatened, or endangered species according to State-determined criteria. All States within the Tennessee-Corridor recognize and list as threatened or endangered those species designated as such by the Federal Government. The land, however, is owned by individuals, corporations, or governments, and within certain restrictions, the fates of the organisms and habitats occupying the land are essentially controlled by the landowner.

Planning and Management Alternatives

The alternatives presented below are oriented toward the general goal of promoting stewardship of the wildlife and wildland resources of the Tennessee-Tombigbee Corridor. Some of these resources are renewable and can be utilized consumptively; some are renewable but should be used in nonconsumptive ways; and some are nonrenewable and should be protected. As with the other resources of the Corridor, the regional or local planners should strive to strike short- and long-term balances between the resource carabilities and the public demands and impacts on these resources.

Inventory and classification

As an initial step to planning studies, the wildlife and wildland resources of the Tennessee-Tombigbee Corridor should be inventoried and classified, and the data stored for later use. The planners should determine the types of data and the levels of detail needed to ensure that adequate information is collected. For most game and nongame species, occurrence and relative abundance data and information on the location, ownership, and land use designation of suitable habitat tracts should be adequate for initial planning purposes. Information concerning rare, threatened, and endangered species, and the location and status of unique environmental features of the region should be site specific and as detailed as is reasonably feasible.

Much information concerning the environmental resources of the Tennessee-Tombigbee Corridor is currently available (Nungesser et al. 1982; US Department of the Interior 1981, 1982). At present, the IDAS system available for the Tennessee-Tombigbee Corridor has digitized data on land cover, wetlands, streams, and wildlife resources, i.e., deer densities, wild turkey densities, mussel beds, and colonial nesting bird sites. Information concerning rare, threatened, and endangered species and the location and status of unique environmental features of the region can be obtained from the US Fish and Wildlife Service's Office of Endangered Species and from the respective states (addresses given below).

a. Endangered Species Specialist
US Fish and Wildlife Service
Richard B. Russell Federal Building
75 Spring Street, SW
Atlanta, GA 30303
Phone: (404) 221-3583

b. Mr. Ken Gordon, Director
Mississippi Natural Heritage Program
111 N. Jefferson Street
Jackson, MS 39202
Phone: (601) 354-7226

c. Ms. Doreen Miller
Alabama Department of Conservation
Union Street Administrative Building
Montgomery, AL 36130
Phone: (205) 261-3154

d. Mr. Sam Pearsall, Director
Ecological Services Division
Tennessee Department of Conservation
Customs House
701 Broadway
Nashville, TN 37219-5237
Phone: (615) 742-6545

e. Mr. Richard Hannan, Director
Kentucky Nature Preserves Commission
407 Broadway
Frankfort, KY 40601
Phone: (502) 564-2886

Additional data can be obtained from the various government agencies involved in the conservation and management of the natural resources of the area. Federal agencies include the Corps of Engineers, the Fish and Wildlife Service, the Forest Service, the National Park Service, the Soil Conservation Service, and the Tennessee Valley Authority. State agencies include those

responsible for the state's fisheries, forestry, park, and wildlife resources.

The regional planning agencies should develop an active cooperative program of inventory and classification of natural areas with their respective state natural heritage commissions. These commissions are eager to cooperate and assist in planning activities, and they can normally be most effective when they are contacted early in the planning process. In most cases, these offices maintain computerized files of data on important plant and animal species and unique environmental features. This information is generally compiled from published and other secondary sources supplemented by original data collected by field surveys as funds and priorities dictate. However, because of the changing and sensitive nature of their data, these agencies prefer to respond to requests for site-specific data; they discourage "blanket" requests for extensive areas.

Information and education

Information and education programs about the wildlife and wildland resources of the Corridor should be focused both at the private landowners and the general public. These programs can inform private landowners of the benefits of conserving wildlife habitat and unique environmental features on their lands. These programs inform the using public of the availability and value of these resources, and should encourage them to respect the public resources and the rights of private landowners.

The goal of these programs should be to promote the preservation and wise utilization of these wildlife and wildland resources. In cooperation with the various Federal and State natural resources agencies, the regional planning agencies should publicize the resources of their areas. They should also publicize the public and private facilities that provide access to these resources in order to encourage responsible and effective use.

This publicity should include information that would allow the public to understand, appreciate, and locate these resources. Areas containing these wildlife and wildland resources should be clearly identified and delineated. Brochures detailing the objectives, features, permitted uses, and any need for special permits or fee charges should be prepared. Maps that provide clear directions to and an effective overview of these areas should be made available.

Assistance

Assistance programs should be directed at providing technical and

marketing assistance to private landowners and at facilitating access to these private resources for members of the general public. A number of government agencies (Federal and State) have the necessary expertise available to provide technical assistance in managing and utilizing wildlife and wildland resources. The regional planning agency should work to develop an active cooperation between these various agencies, the private landowners, and the civic and financial institutions of the area such that these resources are developed and utilized in a positive, coordinated manner.

Public utilization of these resources should be encouraged and facilitated. The demand generated by public desire to utilize these resources could provide direct and indirect economic benefits to the participating landowners as well as to the community as a whole.

Taxation

The conservation of wildlife and wildland resources will be enhanced if the private landowners can derive tax benefits from participating in these efforts. The regional planning agencies should contact their respective state wildlife departments and state natural heritage programs in order to review existing state tax codes regarding wildlife and wildland resources. These groups should cooperatively develop tax proposals that would encourage private landowners to maintain currently existing habitat and unique environmental features, and to restore wildlife habitat whenever feasible.

Purchase and management

The regional planning agency should be alert to situations where private landowners are considering the sale or donation of wildlife habitat and/or unique environmental areas. By developing an active presence in the communities of their respective areas, these planning agencies can often hear of or facilitate opportunities to purchase, or accept as gifts, significant wildlife or wildland resources. This grassroots approach to regional conservation should be encouraged, and a cooperative venture should be developed between the planning agencies and their respective state natural heritage commissions and wildlife departments.

References

Giles, R. H. 1978. Wildlife Management, W. H. Freeman and Co., San Francisco, Calif.

Nungesser, M. K., Switek, J., Tucker, C. S., Frank, M., Wright, L. L., Hunsaker, C. T., and Sigal, L. L. 1982. "Environmental Resources of the Tennessee-Tombigbee Corridor, Vols I-X," US Army Engineer District, Nashville (prepared by Oak Ridge National Laboratory, Oak Ridge, Tenn.).

US Department of the Interior. 1981. "A Resource Inventory of the Tennessee-Tombigbee Corridor, Vols I and II," Planning-Aid Report to US Army Engineer Districts, Nashville and Mobile (prepared by US Fish and Wildlife Service, Decatur, Ala.).

_____. 1982. "A Supplemental Resource Inventory for the Tennessee-Tombigbee Corridor: Jefferson, Bibb and Tuscaloosa Counties," Planning-Aid Report to US Army Engineer Districts, Nashville and Mobile (prepared by US Fish and Wildlife Service, Decatur, Ala.).

PART XIV: LEGAL REVIEW

Introduction

This part contains summaries of the regulatory requirements affecting planning and land use changes in the states of the Tennessee-Tombigbee Corridor. Information is presented on the regulatory controls and standards for water quality; air quality; hazardous wastes, radioactive materials, and pesticides; solid waste disposal; and noise. General discussions of the requirements that are applicable to all of the Corridor states are presented in the following paragraphs. More detailed legal reviews are then presented to outline the requirements specific to each state.

Water Quality

Water quality standards

Water quality standards are established to protect streams for use by humans and fish and wildlife. The standards set levels of contaminants or water quality parameters that are acceptable and will achieve the protection objectives.

Water quality planning

Basinwide quality plans are established to identify pollutant sources and to plan for procedures for controlling pollution. The water quality plans (called Section 208 plans) are prepared for regions or separate river basins. The 208 plans contain information on stream use classifications and water quality information.

Air Quality

Clean air is a requirement for human health. Air quality problems normally are associated with urban, industrialized environments. While these areas comprise a small part of the Corridor study area, development caused by the waterway or accompanying it can result in air pollution that reduces the air quality. Protection of local air quality became a national priority with the Clean Air Act of 1970 and the 1977 amendments. The Act set up requirements for national air quality standards and required that states develop

State Implementation Plans (SIPs) for attaining the clean air goals of the Act.

Air quality standards

Air quality standards are established to protect and enhance air quality. The various standards and their applicability are summarized in Table 15. Ambient Air Quality Standards are developed to protect human health (primary standards) and public welfare (secondary standards). Each of the Corridor states has adopted the national standards; Mississippi and Kentucky have implemented additional standards specific to conditions within those states.

Prevention of Significant Deterioration (PSD) regulations

After the establishment of ambient air standards, the US Environmental Protection Agency (EPA) divided the country into homogeneous air quality control regions (AQCRs) and classified each region. The AQCRs were designated as Class I, II, or III based on the amount of increase in various pollutants to be allowed above baseline conditions. Based on the AQCR classification, development within the region is allowed only if the increment of pollutants produced by the development does not result in pollutant levels that exceed the PSD levels for that land classification. Class I areas are highly valuable environmental areas or areas which are to be protected, such as national parks. Designation as Class II permits well-managed growth by allowing moderate deterioration of existing air quality. Most of the country is classified as Class II. Class III regulations permit greater industrial growth and deterioration up to the secondary standard.

In addition to the above classification, AQCRs were classified on the basis of how well ambient air quality standards are met. Based on existing information, the AQCRs were classified as:

a. Attainment areas. Air quality levels better than the national standards.

b. Nonattainment areas. Air quality levels did not meet the national standards.

c. Cannot be classified. Insufficient information is available.

PSD review for new sources

In the states of Mississippi, Tennessee, and Kentucky, before construction of a major new source of pollution, a preconstruction review and permit

Table 15

Summary of Air Quality Standards Applicability

Standard	Purpose	Applicability
National Ambient Air Quality Standards	Primary Standards-protect human health	Statewide
	Secondary Standards-protect public welfare, i.e., protect and minimize effects on soil, vegetation, man-made materials, visibility, and personal comfort and well-being	
Prevention of Significant Deterioration Regulations (Class I, II, or III)	Set limits on amount of additional pollutants allowed in an area	All counties are Class II
New Source Performance Standards	Emission Standards-for new sources of pollution	Industry or other new source of pollution
Di Minimis Standards		Minimum increments for requiring monitoring in permits

may be required. In Alabama, regulations require a preconstruction permit in addition to an operation permit. The purpose of the preconstruction review is to ensure that new pollution sources will not violate the ambient air quality standards. A PSD review is appropriate for all new sources which have the potential to emit 250 tons per year of any air pollutant. Emission standards for each of the major source categories have been established along with national hazardous emission standards. The permit applicant must demonstrate that the proposed new source will not cause pollutant concentrations in excess of:

a. Ambient air quality standards.

b. New source performance standards for that major source category.

c. National hazardous emission standards.

Table 16 presents the maximum allowable increases over baseline conditions for Classes I-III (40 Code of Federal Regulations Part 52.21).

Table 16

Maximum Allowable Increases over Baseline Conditions

Pollutant	Land Classification		
	Class I	Class II	Class III
Sulfur dioxide ($\mu g/m^3$)			
Annual geometric mean	2	20	40
24-hr maximum	5	91	182
3-hr maximum	25	512	700
Particulates ($\mu g/m^3$)			
Annual geometric mean	5	19	37
24-hr maximum	10	37	75

New emission sources or modifications to emissions that are significant are regulated by PSD review conducted by the state monitoring agency. Emission increases that are below the rates in Table 16 are considered insignificant. If the increase in a pollutant caused by a new source or modification is below the de minimis levels (Table 17), the monitoring and analysis requirements in the permit application can be waived by the monitoring agency.

Table 17

De Minimis Air Quality Levels

Contaminant	De Minimis Level
Total suspended particulate*	10 $\mu g/m^3$, 24-hr average
Carbon monoxide	575 $\mu g/m^3$, 8-hr average
Nitrogen dioxide	14 $\mu g/m^3$, 24-hr average
Total suspended particulate	10 $\mu g/m^3$, 24-hr average
Sulfur dioxide	13 $\mu g/m^3$, 24-hr average
Ozone	No standard provided
Lead	0.1 $\mu g/m^3$, 24-hr average
Mercury	0.25 $\mu g/m^3$, 24-hr average
Beryllium	0.0005 $\mu g/m^3$, 24-hr average
Fluorides	0.25 $\mu g/m^3$, 24-hr average
Vinyl chloride	15 $\mu g/m^3$, 24-hr average
Total reduced sulfur	10 $\mu g/m^3$, 1-hr average
Hydrogen sulfide	0.04 $\mu g/m^3$, 1-hr average
Reduced sulfur compounds	10 $\mu g/m^3$, 1-hr average

* Applicable only in Mississippi.

Applicants for new source permits provide a preliminary engineering study on design, capacity, and schedules for construction and operation of the facility. To determine the changes in air quality, information may be required on impairment to visibility and on the impacts to soils and vegetation that occur as a result of the source. The air quality impact is projected for the area as a result of growth of the source and the general commercial, residential, and industrial growth associated with the source. This information is used by the monitoring agency of the state to model changes in air quality caused by the proposed new source. Based on the information about the new source, results of the modeling of air quality, and preceding monitoring data, a construction permit is either permitted or denied.

Permits set limits on the amount of various air pollutants allowed and require monitoring of the source. The permits normally require application of the best available control technology (BACT) for each pollutant involved, and each new major source is required to meet the lowest achievable emission

rate for that source type. These requirements become part of the compliance provisions that are monitored and enforced by the appropriate state agency. For nonattainment areas, a new source may be required to formulate a strategy for protection of air quality through methods such as emission offsets, banked credits, or combinations of these practices.

Air quality monitoring

Requirements for air quality monitoring vary among the Corridor states. A monitoring program for source polluters may be incorporated into permit requirements, and specific stations may be designated to monitor ambient air quality. The monitoring information derived is used to model changes in air quality.

Hazardous Wastes, Radioactive Materials, and Pesticides

Hazardous wastes

EPA regulations. Regulations regarding the identification and management of hazardous wastes vary among the Corridor states. Many of the state requirements are based on the standards set out by EPA, with additional provisions as needed. The EPA regulations are complex and require technical expertise for correct application. The material presented in the state reviews that follow is intended to serve as a guide and explanation of the relationships between local governments and hazardous waste generators, transporters, and operators of storage or treatment facilities.

Identification. Industrial, agricultural, and commercial establishments that produce solid waste, sludge, garbage, or refuse could be subject to hazardous waste regulations. Normally the operation will be of such size or technical nature as to be cognizant of applicability of hazardous wastes regulations. To determine applicability of hazardous wastes rules, the EPA has established (a) lists of regulated hazardous wastes, (b) standards and tests to determine if an unlisted substance or waste is hazardous, and (c) lists of hazardous wastes produced by specific industries. Citations for these provisions are listed in Table 18. The EPA has also established categories of exemptions for activities and substances.

For wastes or substances not listed, the EPA has a set of tests to determine if a substance is subject to regulation as a hazardous substance. The tests are for (a) ignitability, (b) corrosivity, (c) reactivity, and

(d) toxicity. The criteria for these properties are contained in 40 CFR 261.22. Wastes that exceed the limits or maximums for the tests are considered hazardous wastes.

Table 18

EPA Lists of Regulated Hazardous Wastes

Title	Citation*
Hazardous Constituents	40 CFR 261.10 - .11 and Appendixes VIII and X
Acute Hazardous Wastes	40 CFR 261.33(a)-(e)
Toxic Wastes	40 CFR 261.33(f)
Hazardous Wastes from Nonspecific Sources	40 CFR 261.30 and .31
Hazardous Wastes from Wood Preservation and Inorganic Pigment Industries	40 CFR 261.30 and .32
Hazardous Wastes from Organic and Inorganic Chemical Industries	40 CFR 261.30 and .32
Hazardous Wastes from Pesticide Industries	40 CFR 261.30 and .32
Hazardous Wastes from Explosive Manufacturing	40 CFR 261.30 and .32
Hazardous Wastes from Petroleum Refining Industries	40 CFR 261.30 and .32
Hazardous Wastes from Iron and Steel and Coking and Secondary Lead Industries	40 CFR 261.30 and .32

* Code of Federal Regulations.

Exemptions. EPA established categories for exemptions for certain activities and small quantities of hazardous wastes (40 CFR 261.11). The exemptions are as follows:

Topic	Citation
Wastes not considered solid wastes	40 CFR 261.4(a)
Solid wastes that are not hazardous	40 CFR 261.4(a)
Small quantity generators of hazardous wastes	40 CFR 261.4(a)

EPA notification of hazardous waste generation. Generators of hazardous wastes must notify the State agency responsible for hazardous wastes, after

it has been determined that hazardous wastes will be produced, based on one of the above rationales. EPA Form 8700-12 is used as official notification to the EPA Administrator by generators, transporters, and operators of hazardous waste facilities. (Operators of underground injection wells use other forms applicable to their activities.)

Transportation of hazardous wastes. Transportation of hazardous wastes from generator to offsite storage or treatment facility is documented by an EPA manifest. The manifest becomes the record of disposition of the hazardous wastes produced by a generator. The manifest records: (a) the nature and quantity of hazardous wastes, (b) transporter(s), and (c) the facility that accepted the wastes for storage and/or treatment. After acceptance by a facility operator, a copy of the completed manifest is returned to the generator and kept for 3 years.

Operation of hazardous wastes facilities. EPA regulates every aspect of the operation of a facility for treatment or storage of hazardous wastes. Prior to the operation of a facility, a permit application must be processed by EPA. The permit application contains information on the type of materials to be handled by the facility, the treatment processes to be used, and detailed emergency plans and safety precautions (40 CFR 270).

Siting and operation plans. The siting and operation of hazardous waste facilities in Mississippi, Alabama, and Tennessee are regulated by EPA to protect the health of the nearby community and minimize impact on the environment. The CFR citations for different aspects of facility operation are set out in Table 19. The major requirements of the regulations are summarized below. The operation of hazardous waste facilities in Kentucky is regulated by Kentucky Administrative Regulations.

Hazardous waste facilities are to be located in areas that are safe from seismic (earthquake) activity. Facilities located within the 100-year floodplain must be safe from washouts by floodwaters, or the facilities must have procedures for effective, safe removal of wastes (40 CFR 264.18). The facilities are to be designed to protect or minimize adverse effects on air quality, surface- and ground-water quality, and movement or migration of the disposal material through the subsurface environment (40 CFR 267.10). Monitoring of ground water is required (40 CFR 267.50-.53). Design guidance is set out for hazardous wastes landfills, impoundments, underground injection, and land disposal facilities (40 CFR 265).

Table 19

CFR Citations for Operations of Hazardous Waste Facilities

Siting and Operation Plans	Citation
Siting or Location (Subpart A)	40 CFR 246.18
Operation Plans (Subpart B)	40 CFR 246.10-.16
Emergency Preparedness (Subparts C and D)	40 CFR 246.30-.37, 40 CFR 246.50-.57
Reports and Recordkeeping (Subpart E)	40 CFR 246.70-.77
Environmental Performance Standards	40 CFR 247.10
Ground-Water Monitoring	40 CFR 267.50-.53

Hazardous waste facilities are required to develop a number of plans for operation of the facility. A hazardous waste analysis plan is required. This plan sets out the physical and/or chemical analyses to be used on each shipment of wastes received by the facility. A physical security plan is developed which protects the facility from unauthorized entry by man or livestock. An inspection system is set up for maintenance and safety purposes. The inspection system includes inspection of operation procedures, structural equipment, and security devices. There are to be daily inspections of areas subject to spills. Training for all personnel for operations and emergency procedures is also required.

Emergency preparedness. Facilities are prepared for emergencies by acquiring adequate safety equipment and developing contingency plans. Extensive emergency equipment (e.g., firefighting) is required for all facilities. Contingency plans are developed for each facility. These plans set out procedures to be followed in case of fire, explosion, or release of hazardous wastes or hazardous waste constituents. An emergency coordinator is designated for each facility. This employee is responsible for coordination of all emergency operations, including notification of EPA and state authorities.

Reports and recordkeeping. Facilities maintain the hazardous waste manifests of shipments received at the facility for a period of 3 years. In addition, a facility operating record is maintained. This includes a record

of each shipment received and its method of treatment, records of waste analyses, and reports of the incidents requiring implementation of the facility contingency plan. Biennial reports are required by EPA to summarize activities at the facility.

Radioactive materials

The use and disposal of radioactive materials are regulated by the EPA and by State law. Mississippi and Alabama participate in the Southeast Interstate Low-Level Radioactive Waste Compact. The Compact was instituted under provisions of Public Law 92-573, Low-Level Radioactive Waste Policy Act. The Act provided for regional management of low-level radiation wastes. The purposes of the Compact activities are to: (a) provide sufficient but limited facilities for disposal of radioactive waste generated in the region, (b) encourage reduction of levels of low-level radioactive wastes, (c) ensure ecological and economical management of wastes, and (d) ensure the costs, benefits, and obligations of disposal activities are equally distributed among the Compact states. States are responsible for enforcing Federal and State laws and regulations pertaining to packaging and transporting within or through a state. The designated regional disposal facility is currently the Barnwell facility in South Carolina. Tennessee State Regulations for Protection Against Radiation outline a licensing procedure for the usage of radioactive materials.

Pesticides

The use and disposal of pesticides is regulated by EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and by the appropriate state regulations and agencies.

Registration of pesticides. Under EPA regulations, registration of a pesticide with the Regional EPA Administrator is required before a pesticide may be distributed, sold, shipped, or delivered. An applicant for registration furnishes the EPA information on the chemical composition of the pesticide, the results of available analyses on the pesticide, and available information on any adverse effects of the pesticide on the environment. Depending on the adverse environmental effects, the Administrator classifies the pesticide either for general use or for specific restricted uses (40 CFR Section 162.2, .5, .6, .8, .10, .13; 162.160-.177). Exemptions to the FIFRA regulations are for pesticides regulated by another agency, e.g., drugs, biological control agents, and certain pesticides (40 CFR, Sections 162.5(c)

and (d)). The intent of FIFRA is to regulate pesticides in interstate commerce; however, registration is also required for solely intrastate distribution of pesticides (40 CFR Section 162.17).

Pesticide use. Pesticide use is restricted by the classification (general or restricted) determined by EPA, by state law, and by permit requirements for experimental use. At the time of registration, the permitted uses are determined by the EPA (40 CFR Section 162).

Pesticide disposal. Restrictions on disposal of pesticides and pesticide-related wastes do not apply to single containers or pesticides registered for use in home and garden or on farms and ranches. Recommended procedures for disposal of pesticides, pesticide wastes, pesticide containers, and residue are contained in 40 CFR Section 165.2, .3, .4, .7, .8, and .11.

Solid Waste Disposal

Solid waste facilities are operated under state laws to protect public health and land and water quality. A state agency is designated to administer solid waste disposal and processing.

Noise

Federal laws pertaining to noise are directed at regulating noise in the workplace, noise produced by transportation sources, and performance standards for certain products (Erickson 1979). The States of Mississippi, Alabama, and Tennessee have no state laws regulating noise; the Federal statutes provide the standards. However, by the State Noise Control Act, the Kentucky Natural Resources and Environmental Protection Cabinet has been given authority to regulate and develop plans for the control of environmental noise (as opposed to workplace or occupational noise).

Transportation vehicle emission limits

The EPA established the emission limits in Table 20 for interstate rail and motor vehicle transportation. The rail requirements apply to all rail cars and locomotives, except steam locomotives, and total sound level emitted by rail cars and locomotives. The requirements do not apply to gas turbine-powered locomotives (40 CFR 201.1-.28). The motor vehicle standards apply

Table 20

Noise Emission Standards for Rail and Motor Vehicles

		Standard
Locomotives	(40 CFR 201.1-.28)	
Built before 1980		
Moving		≤ 96 dBA
Stationery		≤ 96 dBA
Idle		≤ 73 dBA
Built after 1980		
Moving		≤ 90 dBA
Stationery		≤ 87 dBA
Idle		≤ 70 dBA
Switcher Locomotives		
Built before 1980		
Stationery		≤ 65 dBA
Any throttle except idle		≤ 87 dBA
Idle		≤ 70 dBA
Moving Rail Cars		
≤ 75 km/hr (45 mph)		< 88 dBA
> 75 km/hr (45 mph)		< 93 dBA
Retarders		< 83 dBA
Car Coupling Operations		< 92 dBA
Interstate Motor Vehicles	(40 CFR 202.10-.23)	
Speed limit - 35 mph or less		≤ 86 dBA
Speed limit - over 35 mph		≤ 90 dBA

to interstate carriers with a gross weight in excess of 10,000 lb (40 CFR 202.10-.23).

Consideration of noise in planning

The consideration of noise and noise regulation in planning for the Corridor states is restricted to the interstate commerce regulations cited above. In planning for use of Corridor lands, it is desirable to consider noise impacts that occur as use of the Corridor lands changes.

Effects of noise. Exposure to noise over time can have detrimental physiological and social effects. High-intensity noise (e.g., heavy construction equipment) can cause temporary constriction of blood vessels and an increase in tension and fatigue. Noise can cause disruption of sleep patterns (temporary) and temporary or permanent hearing loss. Social behavior can be impacted if the noise interrupts basic auditory communication. The siting of activities causing annoying noise impacts can result in property devaluation due to land use incompatibility (Jain, Urban, and Stacey 1981).

Sources of noise. Construction and operation activities result in noise that may cause social or physiological impacts. Noise impacts of construction activities at water resource projects are often confined to the construction site and the construction workers. Construction equipment noise emissions are regulated by the EPA. Operational noise impacts may cause annoying social impacts depending on adjacent land uses (Jain, Urban, and Stacey 1981).

Mississippi Legal Review

Water quality

Standards. The state water quality standards are summarized in the Environmental Inventories (pp VI-70 and VII-73). Future actions within the Corridor are affected by these standards because water quality conditions are monitored and violations are handled by the Bureau of Pollution Control, Mississippi Department of Natural Resources. The water quality standards are based on the intended use of the water; i.e., the standards for drinking water and food processing are more stringent than those for other purposes and represent the contaminant levels for public water supply systems. The other water quality criteria discussed are for discharges into waters designated for fish, wildlife, and ephemeral streams and for recreation.

Application of the standards. Streams or stream segments have been

classified as suitable for different uses (Tables VII.2, pp VI-74 and VII-71). Streams or stream segments not classified for recreation or drinking water are considered as classified for fish, wildlife, and ephemeral streams. The standards apply to those designated stream uses. Discharges must not result in changes in the levels of the parameters that exceed those of the standards for the receiving water's designated use(s). New discharges must have permits prior to making pollutant discharges.

Water quality planning. Information needed to prepare the basinwide water quality plans (Section 208 plans) is included in the Environmental Inventories, as outlined below.

Topic	Environmental Inventories	
Stream Use Classification - Tables VII.2	VI-74	VII-71
Municipal Wastewater Sources and Type Treatment - Table VII.5	VI-82	VII-78
Private, Federal, and Institutional Dischargers - Table VII.6	VI-83	VII-80
Industrial Waste Sources - Table VII.7	VI-84	VII-81
Stream, Segment Quality Classification - Table VII.8	VI-88	VII-85
Waste Load Allocation - Table VII.9	VI-90	VII-88

Trends in water quality are documented biannually, as required by Section 305b of the Clean Water Act. These reports document the water quality monitoring system and show trends in water quality by examining changes in the water quality parameters. The 305b report summarizes trends in water quality for each river basin in the state. Problems with point and nonpoint source pollution are identified for surface and ground-water resources (Bureau of Pollution Control 1984a). Appendixes A (pp VI-117 and VII-117) of the Inventories contain summary information on water quality monitoring for water temperature, dissolved oxygen, biological oxygen demand, and pH. Water quality monitoring information is available through EPA's STORET and the US

Geological Survey's WATSTORE systems (see Resource Inventories for access information).

Permitting process required for discharges. Any anticipated new point source discharges of wastewater must be approved by obtaining either a National Pollution Discharge Elimination System (NPDES) permit, a State Operating Permit, or a Underground Injection Control (UIC) Permit. NPDES permits are for wastewater discharge to surface waters, UIC permits are for underground injection of wastewater, and State Operating Permits are for disposal by any other means, such as land application or recycling systems. There are only three UIC permits on the state. Discharge into state streams is the most frequently used method for wastewater disposal (Bureau of Pollution Control 1984a).

The NPDES permits and the conditions required under them are based on the water quality existing in the stream segments and the sources that are already discharging into the segments. Each discharger, through the permitting process, is assigned a waste load allocation.* The waste load allocation is the amount of pollution the new discharger is allowed to add to the stream segment.

Permit applications require dischargers to show discharge volumes and planned treatment for discharges. A water quality model is used to determine the change in water quality in that stream segment due to the additional discharge. The model uses low flow records, and the velocity, slope, point source dischargers, and design flow data to calculate changes in water quality. Using the model and permit application information on anticipated discharge and treatment levels, the water quality changes are calculated. If the model calculations show that no violations of water quality standards occur with the treatment levels, then they are recommended for the permit. If violations would occur, then more stringent treatment levels are used in the model to calculate the water quality changes. The treatment levels are adjusted (i.e. more advanced treatment levels used) until no violations of standards are indicated. For municipal NPDES permits in Mississippi, the

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* A waste load allocation is that portion of the total maximum daily load which is allocated to a discharger located on a particular stream segment. The total maximum daily load is defined as the total maximum load, usually expressed in pounds per day, of pollutants allowable by water quality standards under a given set of flow and temperature conditions.

standards used are on pages VI-93 and VII-94 of the Environmental Inventories. The standards for biological oxygen demand and nitrogen vary with each case for the municipal permits.

Pretreatment permits. In 1982, the Bureau of Pollution Control assumed responsibility for EPA's pretreatment permit program. Pretreatment permits are required for industrial dischargers that utilize publicly owned treatment works (POTW). The purpose of the pretreatment program is to regulate discharges into POTW that, due to the constituents contained in the discharge, could damage or interfere, e.g., sludge accumulation, with the operation of the POTW. The Bureau uses EPA standards for different industrial categories (Bureau of Pollution Control 1984a, Chap IV).

Standards for drinking water and food processing. Water classed for public water supply must be suitable for drinking water and food processing purposes. The following standards apply:

a. Bacteria: fecal coliforms shall not exceed 2,000/100 ml as a geometric mean based on at least five samples taken over a 30-day period, nor exceed 4,000/100 ml in any one sample.

b. The range of pH shall not be caused to vary more than 1.0 unit above or below normal pH and it shall be ≥ 6.0 and ≤ 8.5. If the background pH is outside the 6.0-8.5 range, the pH may change more, if the Commission determines it will not affect stream usage adversely.

c. Table 21 gives the maximum levels of substances. The following waters are classified as public water supplies:

(1) Luxapalila Creek, from the Mississippi-Alabama state line to Highway 50.

(2) Yellow Creek, from the Mississippi-Alabama state line to the Luxapalila Creek.

(3) Tennessee River, from the Mississippi-Alabama state line to the Mississippi-Tennessee state line.

(4) Barnett Reservoir, from the river bend to the reservoir dam (part of it is also classified as a recreational area).

(5) Pearl River, from the Barnett Reservoir to the Jackson water intake.

(6) Bonita Reservoir, in Lauderdale County.

(7) Flint Creek Reservoir, in Stone County (also classified as a recreational area).

(8) Long Creek Reservoir in Lauderdale County.

(9) Okatibbee Reservoir, in Lauderdale County (also classified as a recreational area).

Table 21

Maximum Levels for Drinking Waters

Substance	Maximum Level
Chlorides	250 mg/ℓ
Specific conductance	500 micromhos/cm
Dissolved solids	500 mg/ℓ
Threshold odor number	24 daily average (at 60° C)
Phenolic compounds	0.001 mg/ℓ
Gross beta	1,000 micro UCI (in the absence of strontium-90 and alpha emitters)
Arsenic	0.05 mg/ℓ
Barium	1.0 mg/ℓ
Cadmium	0.01 mg/ℓ
Chromium (hexavalent)	0.05 mg/ℓ
Cyanide	0.025 mg/ℓ
Fluoride	1.2 mg/ℓ
Lead	0.05 mg/ℓ
Mercury	0.002 mg/ℓ
Nitrate (as N)	10.0 mg/ℓ
Selenium	0.01 mg/ℓ
Silver	0.05 mg/ℓ

Water quality criteria for fish, wildlife and ephemeral streams. Waters in this classification are intended for fishing and for propagation of fish, aquatic life, and wildlife. They must meet the criteria listed in Table 22 as well as the following regarding bacteria: fecal coliform shall not exceed a log mean of 2,000/100 ml, nor shall more than 10 percent of the samples exceed 4,000/100 ml.

All waters not specifically classified as public water supplies, shellfish harvesting areas, or recreational areas are classified as fish and wildlife waters. In addition, water quality criteria are established for the Mississippi River (Table 23) and for ephemeral streams.

Ephemeral streams are natural watercourses that flow in direct response to precipitation and whose channels are normally above the ground-water table.

Table 22

Maximum Levels of Fishing Waters

Substance	Maximum Level
Specific conductance	1,000 micromhos/cm
Dissolved solids	750 mg/ℓ monthly average, 1,500 mg/ℓ at any time
Phenolic compounds	0.05 mg/ℓ

Table 23

Maximum Levels for the Mississippi River

	Stream Reach	
Minerals	From MS-TN Border to Vicksburg	From Vicksburg to MS-LA Border
Chlorides	60 mg/ℓ	75 mg/ℓ
Sulfates	150 mg/ℓ	120 mg/ℓ
Total dissolved solids	425 mg/ℓ	400 mg/ℓ

These streams do not support a fisheries resource and are not usable for human consumption or aquatic life. The waters must be such that all downstream water standards may be maintained. The water should be free of foreign substances and toxic or harmful wastes. Dissolved oxygen should be maintained at an appropriate level to avoid nuisance conditions. The permit board may assign bacteria criteria where there is a possibility of a public health hazard or if other circumstances warrant.

Water quality criteria for recreational waters. Waters classed for recreation are also suitable for uses which waters of lower quality are suitable. Recreational waters must meet the following criteria:

a. Bacteria: fecal coliforms shall not exceed a log mean of 200/100 ml nor shall more than 10 percent of the samples examined during any month exceed 400/100 ml.

b. Specific conductance: no substances added which will increase the conductivity above 1,000 micromhos/cm for freshwater streams.

c. Dissolved solids: no substances added which will cause dissolved solids to exceed 750 mg/ℓ as a monthly average value, nor exceed 1,500 mg/ℓ at any time for freshwater streams.

Air quality

Mississippi and the Clean Air Act. As required by the Clean Air Act of 1970 and the 1977 amendments, Mississippi developed a State Implementation Plan (SIP) for attaining the clean air goals of the Act. Under terms of the Mississippi Air and Water Pollution Control Law, the Bureau of Pollution Control of the Mississippi Department of Natural Resources is responsible for the implementing provisions of the Mississippi SIP. Protection of air quality has been accomplished by establishment of air quality standards, classification of areas according to air quality, limiting or regulating construction of new sources of pollution, and monitoring of air quality (Bureau of Pollution Control, Regulation APC-S-2, "Permit Regulations for the Construction and/or Operation of Air Emission Equipment"; Resource Inventories VI and VII, Chap. VIII).

Standards. Mississippi adopted the National Ambient Air Quality Standards (see Table 15) and added a standard for odor. The current standards are presented in Table 24 (Regulation APC-S-4, "Regulation for the Prevention of Air Pollution Emergency Episodes").

Air quality control regions. As discussed, EPA classified the AQCRs as Classes I-III. In Mississippi, no Class I areas were designated. All counties in the Mississippi Corridor are Class II.

Air quality in the Mississippi Corridor area. Air quality in Mississippi is generally good. Historically, there have been air quality problems in areas outside the Corridor area, i.e., exceedances of the ozone standard in De Soto County and exceedances of total suspended particulate standards in the Laurel area. Monitoring records for 1983 show improvement in these areas (Bureau of Pollution Control 1984b).

New-source pollution. Before construction of a major new source of pollution, a preconstruction review and permit may be required under the Prevention of Significant Deterioration (PSD) regulations. The purpose of this review is to ensure that new pollution sources will not violate the ambient air quality standards. General classes of major sources are listed in Table VIII.3 (pages VI-101 and VII-101). The permit applicant must demonstrate that the proposed new source will not cause pollutant concentrations in excess of:

a. Ambient air quality standards (Table VIII.1, pages VI-98 and VII-98).

Table 24

Mississippi Ambient Air Quality Standards

Contaminant	Primary	Secondary
Sulfur oxides	a. 0.03 ppm annual arithmetic mean b. 0.14 ppm max. 24-hr concentration not to be exceeded more than once per year	0.5 ppm max. 3-hr concentration not to be exceeded more than once per year
Particulate matter	a. 75 $\mu g/m^3$ annual geometric mean b. 260 $\mu g/m^3$ maximum 24-hr concentration not to be exceeded more than once per year	150 $\mu g/m^3$ max. 24-hr concentration not to be exceeded more than once per year
Carbon monoxide	a. 9 ppm max. 8-hr concentration not to be exceeded more than once per year b. 35 ppm max. 1-hr concentration not to be exceeded more than 1 day per year	
Ozone	0.12 ppm max. 1-hr concentration with an expected exceedance of no more than 1 day per year based upon a 3-year average	
Nitrogen dioxide	0.05 ppm annual arithmetic mean	
Lead	1.5 $\mu g/m^3$ maximum quarterly arithmetic mean	
Odor	There shall be no odorous substances in the ambient air in concentrations sufficient to adversely and unreasonably: (1) affect human health and well-being; (2) interfere with the use of enjoyment of property; or (3) affect plant or animal life. In determining that concentrations of such substances in the ambient air are adversely and unreasonably affecting human well-being or the use or enjoyment of property or plant or animal life, the factors to be considered by the Commission will include, without limiting the generality of the foregoing, the number of complaints or petitioners alleging that such a condition exists, the frequency of occurrence of such substances in the ambient air as confirmed by the Department of Natural Resources staff, and the land use of the affected area.	

b. New source performance standards (NSPS) for that major source category.

c. National hazardous emission standards.

New emission sources or modifications to emissions that are significant are regulated by PSD review by the Mississippi Air and Water Pollution Control Permit Board. Emission increases which are below the rates in Table 16 are considered insignificant. If the increase in a pollutant caused by a new source or modification is below the de minimis levels (Table 17), the monitoring and analysis requirements in the permit application can be waived by the Permit Board (Bureau of Pollution Control, Regulation APC-S-2).

The information given in the preliminary engineering study, which applicants for new-source permits are required to submit, is used by the Permit Board to model changes in air quality caused by the proposed new source (Bureau of Pollution Control, Regulation APC-S-2). A buffer zone is required between new-source polluters and incinerators and residential, recreational, and light commercial areas. Based on the information about the new source, results of the modeling of air quality, and preceding monitoring data, a construction permit is either permitted or denied. Permits set limits on the amount of various air pollutants allowed and require monitoring of the source. The permits normally require application of the best available control technology for each pollutant involved, and each new major source is required to meet the lowest achievable emission rate for that source type. These requirements become part of the compliance provisions that are monitored and enforced by the Board. For nonattainment areas, a new source may be required to formulate a strategy for protection of air quality through methods such as banked credits, emission offsets, modification of major sources that have no emission offsets or banked credits, or combinations of these practices (Bureau of Pollution Control, Regulation APC-S-2).

Another type permit, a tolerance permit, is issued to facilities that have permits, but which are causing air pollution levels in excess of the permit terms or in violation of air quality standards (also for facilities which may never have been issued permits). Issuance of tolerance permits may result from faulty or inadequate pollution control equipment. The tolerance permit allows the facility to continue in operation while an implementation plan is prepared to bring the facility into compliance with standards. The implementation schedule must be prepared and submitted within 60 days after

issuance of the permit. The implementation schedule specifies reduction in pollution emissions and changes in operations required to meet air quality standards (Bureau of Pollution Control, Regulation APC-S-2).

Air quality monitoring. Air quality monitoring is accomplished by a series of monitoring stations throughout the State of Mississippi. There is not a large number of monitoring sites within the Corridor area, however. For source polluters, a monitoring program may be incorporated into permit requirements. The Bureau of Pollution Control is responsible for compliance inspection and testing of permitted sources. Monitoring information is used to model changes in air quality. Figure VIII.1 (pages VI-104 and VII-104) shows location of these stations; Table VIII.4 (pages VI-105 and VII-105) shows the information available for sulfur dioxide and total suspended particulates.

Hazardous wastes

Hazardous wastes in Mississippi are regulated by the Solid Waste Division in the Bureau of Pollution Control, Department of Natural Resources. Management of hazardous wastes follows EPA rules and regulations explained in the following section and additional provisions under the Mississippi Solid Waste Disposal Law.

Management. Identification of hazardous wastes follows the standards set out by EPA. Generators of hazardous wastes file with the EPA Administrator to obtain an EPA hazardous waste identification number. This application is filed through the Solid Waste Division (Hazardous Waste Management Regulations, Part 126). Transporters of hazardous wastes follow EPA regulations and Mississippi Public Service Commission transportation requirements and US Department of Transportation rules (Hazardous Wastes Management Regulations, Part 263).

Landfill facilities. The operation of a disposal facility for hazardous wastes requires a permit from the Bureau of Pollution Control. Commercial hazardous waste landfills are regulated by siting, operation, and closing regulations. These landfills are defined as those that receive disposal of more than one type of hazardous waste from more than one site. The application for a hazardous waste landfill must include information on location, plans for operation and closing of the facility, and the organizational structure of the commercial entity involved in the operation.

The location of a landfill should be in an area with soils that can

contain hazardous wastes and where surface- and ground-water resources will not be polluted. Standards for preferred soil types and hydraulic characteristics are suggested in Hazardous Waste Management Regulations, Part 264.18(d). A buffer zone of 0.5 mile (0.8 km) is required between the landfill and any existing school, health care facility, or municipality and a 1,000-ft (305-m) buffer for churches and residences. The buffer zone requirements are considered on a case-by-case basis with each permit and may vary (Hazardous Waste Management Regulations, Part 264.18(c)). After the filing of an application for a permit to establish a hazardous waste landfill, public notification is required and landowners within 0.5 mile of the property line of the proposed site must be notified (Hazardous Waste Management Regulations, Part 124.10). When an application is submitted for landfill siting, a plan must be included for closing and converting the site to some suitable use and maintaining the closed site. Closed hazardous waste landfill sites that are sold must include in the deed provisions for maintenance, to ensure the integrity and safety of the site (Hazardous Waste Management Regulations, Part 270).

EPA notification of hazardous waste generation. Generators of hazardous wastes in Mississippi must notify EPA, coordinating with the Solid Waste Division, after it has been determined that hazardous wastes will be produced, based on the provisions referenced in Table 17. EPA Form 8700-12 is used as official notification to the EPA Administrator by generators, transporters, and operators of hazardous waste facilities. (Operators of underground injection wells use other forms applicable to their activities.)

Radioactive materials

The use and disposal of radioactive materials are regulated by the EPA and by Mississippi law (Regulations for Control of Radiation in Mississippi, Part 801). The State Department of Health is responsible for regulation, use, and disposal of radioactive materials. Mississippi participates in the Southeast Interstate Low-Level Radioactive Waste Compact.

Use of radioactive substances. The Department of Health sets limits on the exposure of humans to radiation based on a calendar quarter basis. These limits are contained in "Standards for Protection Against Radiation" set out by the Mississippi Department of Health (Regulations for Control of Radiation in Mississippi, Part 801, Section D: Standards for Protection Against Radiation) and the US Nuclear Regulatory Commission.

Disposal of radioactive wastes. Radioactive wastes may be disposed of in a sewer if the wastes are sufficiently diluted to meet the criteria set out in State and Federal "Standards for Protection Against Radiation." The Department of Health approves applications for incineration of hazardous wastes, with some exceptions (Regulations for Control of Radiation in Mississippi, Section D, Parts 302, 303, 305, and 306).

Pesticides

The use and disposal of pesticides is regulated by EPA under the FIFRA and by the Division of Plant Industry, Mississippi Department of Agriculture and Commerce.

Registration. Under EPA regulations, registration of a pesticide with the Regional EPA Administrator is required before a pesticide may be distributed, sold, shipped, or delivered. Pesticides distributed within Mississippi must also be registered with the Department of Agriculture and Commerce, and registration is renewed annually (Mississippi Code, Chap. 23). Federal container labeling requirements require information on the registrant producing the pesticide, the ingredients, directions for use, and use classification (40 CFR 162). Department regulations require labeling of pesticide containers with information on the manufacturer and EPA registration. Highly toxic pesticides must contain information on first aid for accidents involving the pesticide (Mississippi Code, Chap. 23). (These requirements do not apply to refined petroleum naphtha or refined petroleum distillate.) In addition, distribution of bulk pesticides requires a permit from the State Entomologist (Regulations Governing Distribution of Economic Poisons in Bulk Containers, Rule 3).

Use. Pesticide use is restricted by the classification (general or restricted) determined by EPA, by Mississippi law, and by permit requirements for experimental use. At the time of registration, the permitted uses are determined by the EPA (40 CFR Section 162). Experimental use permits are required for large-scale testing of pesticides. Permits are required for the experimental use of unregistered pesticides or for a previously unapproved use of a registered pesticide. Laboratory, greenhouse, or small area (10 acres (4 ha) or less) applications are exempted from permit requirements (40 CFR Section 172.2-.6 and .8).

Contact. Information on regulatory controls of pesticides in Mississippi can be obtained from the following:

Department of Agriculture and Commerce
Division of Plant Industry
PO Box 5207
Mississippi State, MS 39762

Solid waste disposal

The Board of Health for Mississippi is responsible for administration of solid waste regulation (Environmental Regulations, Division 400: Solid Waste Management and Vector Control, Part 401).

Prior to construction of a new solid waste disposal site, the Board of Health must issue a construction permit. The design and operations plan must be submitted and approved by the Board (Environmental Regulations, Part 401.34). The Board has issued rules for siting landfill facilities for the protection of the ecosystem and public health (Environmental Regulations, Part 401.39-.75) which include the following:

a. Landfills will be located so that inundation of the 100-year floodplain does not occur.

b. Ground water will be protected by establishment of a protective barrier between the fill bottom and the ground-water level. The Mississippi Geological Survey determines if ground-water borings to evaluate and monitor ground water are required. A natural or synthetic barrier may be required for ground-water protection.

c. Landfills will be located at least 1,000 ft (305 m) from surface-water sources used for recreational or drinking water supply.

d. Suitable amounts of cover material must be readily available.

After construction, the Board inspects the site and an operating permit is issued. Proper land disposal of waste (layers of wastes 2 ft (0.6 m) thick covered by 6 in. (15 cm) of material daily) is specified in the rules. Open burning and incineration are not generally allowed. Operating procedures must include provisions for vector control and dust and litter control. A sanitary landfill site should be operated to prevent erosion and water pollution (Environmental Regulations, Part 401.39-.75). When a site is abandoned, provisions should be made for restricting access and maintaining cover on the site. Wells may be installed to monitor ground-water contamination from leachates from the landfill (Environmental Regulations, Part 401.76-.83).

Noise

The State of Mississippi has no state laws regulating noise; the Federal statutes provide the standards. The Bureau of Pollution Control, Department of Natural Resources, is responsible for motor vehicle traffic noise, including enforcement of Federal noise emission standards.

Water quality

Introduction. The state water quality standards are summarized in the Environmental Inventories (pp I-58, II-62, III-58, IV-66, and V-66). Future actions within the Corridor are affected by these standards because water quality conditions are monitored and violations handled by the Alabama Department of Environmental Management. The water quality standards are based on the intended use of the water; i.e., the water quality standards for drinking water are more stringent than those for other purposes. The Standards specify allowed deviations in water quality parameters for the water use classifications. The parameters regulated are: pH, temperature, dissolved oxygen, bacteria, and turbidity. The standards set out the range or maximum level of the parameter allowed.

Streams on stream segments have been classified as suitable for different uses (Tables VII.2, pp I-59, II-63, III-59, IV-69, and V-67). The standards apply to those designated stream uses. Discharges must not violate the criteria or standard for the receiving water's designated use(s). New discharges must have permits prior to pollutant discharges.

Water quality planning. Information needed to prepare the basinwide water quality (Section 208) plans is included in the Environmental Inventories, as outlined below.

Topic	Environmental Inventories				
Stream Use Classification - Table VII.2	I-59	II-63	III-59	IV-67	V-67
Annual Parameter Averages from Monitoring Data - Table VII.3	I-63	II-65	III-62	IV-71	V-70
Municipal Wastewater Sources and Type Treatment - Table VII.5	I-68	II-70	III-67	IV-80	V-75
Industrial Waste Sources - Table VII.6	I-72	II-71	III-68	IV-81	V-76
Waste Load Allocation - Table VII.7	I-81	II-73	III-70	IV-89	V-78
Stream Segment Classification - Table VII.8	I-85	II-76	III-73	IV-94	V-81

Trends in water quality are documented biannually, as required by Section 305b of the Clean Water Act. These reports document the water quality monitoring system and show trends in water quality by examining changes in the water quality parameters (Alabama Water Improvement Commission 1982a). The 305b report compiles and synthesizes data from the state's water quality monitoring system. The system is composed of 57 monitoring stations throughout the state. The stations monitor various parameters including dissolved oxygen, pH, water temperature, turbidity, and biological oxygen demand (BOD). The water quality trends are summarized for each river basin in the state. The report shows frequency of violation of water quality standards and trends, i.e., improving, degrading, or no change, at all or selected monitoring stations in the basin. The trend and standard violations are evaluated for dissolved oxygen, pH, water temperature, turbidity, and BOD, in some cases. To facilitate evaluation of water quality, the state also monitors macroinvertebrate abundance, metal and organic pollutant accumulation in fish tissue, and PCB and mercury accumulation in fish tissue and bottom sediments (Mobile River delta) (Alabama Water Improvement Commission 1982b). Appendixes A of the Inventories (pp I-127, II-101, III-97, IV-133, and V-III) contain summary information on water quality monitoring for water temperature, dissolved oxygen, biological oxygen demand, pH, and turbidity. Water quality monitoring information is available through EPA's STORET and the US Geological Survey's WATSTORE systems (see Resource Inventories for access information).

Permitting process required for discharges. Any anticipated new point source discharges of wastewater must be approved by obtaining an NPDES permit. This program is part of the EPA's overall program for improving the water quality in the nation's streams. The NPDES system is administered by the Alabama Department of Environmental Management for the EPA (Alabama Water Improvement Commission 1979). In addition to the NPDES permits, nonmunicipal users, i.e. industrial users, of publicly owned treatment works (POTW) are required to obtain State Indirect Discharge (SID) permits (Alabama Water Improvement Commission 1982b, Title I, Chap. 5).

Permit applications require dischargers to show discharge volumes and planned treatment for discharges. A commercial, industrial, or municipal facility that discharges wastewater into any body of surface water is required to obtain an NPDES permit prior to operation of the facility. The permit application specifies the estimated discharge rates and shows planned treatment

for the wastewater. The application contains estimates of pollutants that are to be discharged and a proposed pollution abatement plan. The Department evaluates the application based on water quality standards and the existing discharges in the stream segment. If it is recommended to grant a discharge permit, conditions on the permit may include: (a) proposed effluent limitations and monitoring requirements for specific pollutants, (b) schedule of compliance for meeting the effluent limitations, and (c) other restrictions and conditions that would affect the discharge. If the proposed discharge would result in violation of water quality standards in the receiving stream, a waste load allocation may be required.* Public notice of the application is required and a public hearing can be petitioned by the applicants or the public.

The SID permits are required to protect the POTW from pollutants that may be destructive to or interfere with operation of the wastewater treatment works. The Department uses nationally established pretreatment standards and restricts wastewater levels of such things as BOD, thermal pollution, pH, and solid, viscous, or corrosive pollutants that would damage the treatment plants (Alabama Water Improvement Commission 1982b, Title 1, Chap. 6).

Water quality standards.

a. pH. Sewage, industrial, or other wastes, including those from vessels on waters of the state, shall not cause the pH to deviate more than 1 unit from the normal pH or to be outside the following ranges for designated water uses: (a) for public water supply and shellfish harvesting: 6.5-8.5, (b) for swimming and whole body water-contact sports, for fish and wildlife, for agricultural and industrial water supply, for navigation, and for industrial operations: 6.0-8.5, except estuarine and salt water, for which the range shall be 6.5-8.5.

b. Water temperature. For waters in all use classifications, except as provided for below, the maximum temperature rise above natural temperatures existing before the addition of artificial heat shall not exceed 5° F (-15° C) in streams, lakes and reservoirs, nor shall the maximum water temperature exceed 90° F (32° C). In waters used for swimming and other whole body water-contact sports, public water supply, shellfish harvesting, and fish and wildlife propagation in the Tenessee and Cahaba River Basins and the Tallapoosa River Basin

* A waste load allocation is that portion of the total maximum daily load which is allocated to a discharger located on a particular stream segment. The total maximum daily load is defined as the total maximum load, usually expressed in pounds per day, of pollutants allowable by water quality standards under a given set of flow and temperature conditions.

from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers, which have been designated as supporting smallmouth bass, sauger, and walleye, the temperature shall not exceed 86° F (30° C). In lakes and reservoirs, heated waters shall not be withdrawn from or discharged to the hypolimnion. In all waters, the normal daily and seasonal temperature variations present before the addition of artificial heat shall be maintained. The discharge of heated wastes into any coastal or estuarine waters shall not raise water temperatures more than 4° F (-16° C) above natural between October and May or more than 1.5° F (-17° C) above natural between June and September. There shall be no thermal block to the migration of aquatic organisms. Less stringent requirements may be allowed on some permits.

c. Dissolved oxygen. In water of all use classifications except agricultural and industrial water supply, navigation, and industrial operations, the following dissolved oxygen (DO) standards shall be met:

(1) For a diversified warmwater biota, including game fish, daily DO concentrations shall not be less than 5 mg/ℓ. At all times, except under extreme conditions due to natural causes, it may range between 4 and 5 mg/ℓ, provided that all other water quality parameters are favorable. Normal daily and seasonal fluctuations shall be maintained above these levels. In no event shall the DO level be less than 4 mg/ℓ. Due to discharges from existing impoundments, all new impoundments shall have discharges containing at least 5 mg/ℓ DO.

(2) In coastal waters, surface DO concentrations shall not be less than 5.0 mg/ℓ, except where natural phenomena cause depressed values.

(3) In estuaries and tidal tributaries, DO concentrations shall not be less than 5 mg/ℓ, except in dystrophic waters or where natural conditions cause depressed values.

(4) In waters used for agricultural and industrial supply and industrial operations, DO shall not be less than 3.0 parts/million.

(5) In navigation waters, DO shall not be less than 2.0 parts/million.

DO shall be measured at a depth of 5 ft (1.5 m) in waters 10 ft (3 m) or greater in depth, or at mid-depth in shallower waters.

d. Toxic substances. Permissible amounts of toxic substances; color-, taste- and odor-producing substances; heated liquids; or other deleterious substances from sewage, industrial, or other wastes are limited to such amounts as will not render the waters unsafe or unsuitable for the designated uses into which they are grouped, or injurious to fish, wildlife, and aquatic life. In addition, in waters designated for whole body water-contact sports, only such amounts are permissible as will not impair the palatability of fish or, where applicable, shrimp or crabs; in waters designated for shellfish harvesting and for fish and wildlife, only such amounts

as will not affect marketability of fish and shellfish, including shrimp and crabs, and will not exceed one-tenth of the 96-hr median tolerance limit for fish and aquatic life.

e. Bacteria. Bacteria in water shall meet the following standards:

(1) In public water supplies, fecal coliform bacteria shall not exceed a geometric mean of 2,000/100 ml, or a maximum of 4,000/100 ml in any sample. Geometric mean shall be calculated from at least five samples collected at a given station over a 30-day period at intervals of not less than 24 hr.

(2) In waters used for whole body water-contact sports, there shall be no discharges of sewage or other wastes containing bacteria, treated or untreated, in the immediate vicinity. The geometric mean fecal coliform organism density shall not exceed 100/100 ml in coastal waters and 200/100 ml in other waters designated for this use, unless a second detailed sanitary survey and evaluation shows no significant public health risk.

(3) In water designated for fish and wildlife, fecal coliform bacteria shall not exceed a geometric mean of 1,000/100 ml on a monthly average value, or a maximum of 2,000/100 ml in any sample.

(4) In waters designated for shellfish harvesting, bacteria shall not exceed the limits specified in the latest edition of the National Shellfish Sanitation Program Manual of Operations, Sanitation of Shellfish Growing Areas (EPA).

Drinking water standards. Tables 25 and 26 present the maximum contaminant levels for inorganic and organic substances, respectively, allowed under the Alabama drinking water standards. Table 27 indicates the maximum contaminant levels for fluoride.

Air quality

Alabama and the Clean Air Act. As required by the Clean Air Act of 1970 and the 1977 amendments, Alabama developed a State Implementation Plan (SIP) for attaining the clean air goals of the Act. The Alabama Air Pollution Control Act established the Division of Air Pollution Control for the prevention and abatement of air pollution. The Division administers the SIP. Protection of air quality has been accomplished by establishing air quality standards, classifying areas according to air quality, limiting or regulating construction of new sources of pollution, and monitoring air quality (Air Pollution Control Commission (APCC) 1980). Jefferson County has established a local autonomous air pollution control program in the Bureau of Environmental Health in the County Health Department (Resource Inventories IV, Chap. VIII).

Standards. Alabama and National Ambient Air Quality Standards (see

Table 25

Maximum Contaminant Levels for Inorganic Chemicals

Substance	Concentration mg/ℓ
Arsenic	0.05
Barium	1.0
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.0
Selenium	0.01
Silver	0.05

Table 26

Maximum Organic Contaminant Levels

Substance	Concentration mg/ℓ
Chlorinated hydrocarbons	
Endrin (1,2,3,4,10, 10-hexachloro-6, 7-epoxy-1,4, 4/A,5,6,7,8,8/A-octa-hydro-1,4,-endo, endo 5,8 - di-methano napthalene)	0.002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-trichloro-2, 2-bis [P-methoxyphenyl] ethane)	0.1
Toxaphene (C10/H10/C18-technical chlorinated camphene, 67-69 percent chlorine)	0.005
Chlorophendxys	
2,4-D (2,4-D dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	0.01

Table 27

Maximum Contaminant Levels for Fluoride

Temperature, °F	Temperature, °C	Level mg/ℓ
53.7 and below	12.0 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

Table 15) are the same and are presented in Table VIII.1 on pp I-107, II-83, III-79, IV-107, and V-89.

Air quality control regions. As discussed, EPA classified the AQCRs as Classes I-III. In Alabama there is a Class I area just east of the Corridor study area, the Sipsey Wilderness Area in Lawrence County. All counties in the Alabama corridor are Class II.

In addition to the AQCR attainment classifications, the counties were classified by the Alabama APCC as "Class 1" or Class 2" depending on the percentage of urban population and compliance with the secondary air quality standards (APCC 1984, Chap. 1).

Air quality in the Alabama Corridor area. Air quality in the Alabama part of the Corridor is generally good. A number of nonattainment areas have taken measures to come into compliance with the standards. In Colbert and Lauderdale Counties, the area around the TVA Colbert Steam Plant was a nonattainment area for the secondary ambient air quality standard for sulfur dioxide. Rerouting of emissions from four stacks to a single tall stack was planned to attain ambient standards. Mobile and Jefferson Counties were nonattainment areas for ozone. It was anticipated that as the prevalence of older automobiles decreased, the standard would be met. Total suspended particulate nonattainment areas include (1) in Mobile, downtown and dock areas (for secondary standards), and (2) in Jefferson County, the Birmingham area (for primary standards). Attainment of the particulate standard is through

closing of a cement plant (dock area) and control of fugitive dust (Resource Inventory I, Chap. VIII).

Construction and operation permits. Alabama regulations require a preconstruction permit, in addition to the operation permits. A preconstruction application must be submitted prior to any construction that would produce air pollutants in a significant amount and cause a significant net emission increase. The application sets out a detailed schedule of construction of the pollution source and shows the planned emission reduction system. The Division utilizes an appropriate air quality model to predict the air quality impacts of construction and operation. The issuance of a permit is determined by compliance with air quality standards; development of a plan for complying with restrictions of air pollution alert, warnings, and emergencies; and installation of monitoring equipment, in some cases (APCC, Chap. 16).

General classes of major air pollution sources are listed in the Environmental Inventories, Table VIII.3 (pp I-110, II-86, III-82, IV-110, and V-92). Emission standards for each of the major categories and hazardous emission standards have been established by EPA and these have been adopted by Alabama (APCC 1984, Chaps. 12 and 13). The permit applicant must demonstrate that the proposed new source will not cause pollutant concentrations in excess of:

a. Ambient air quality standards (Table VIII.1).

b. New source performance standards for that major source category.

c. National hazardous emission standards.

New emission sources or modification to emissions that are significant are regulated by preconstruction review. Emission increases that are below the rates in Table 16 are considered insignificant. If the increase in a pollutant caused by a new source or modification is below the de minimis levels (Table 17), the monitoring and analysis requirements in the permit application can be waived.

The information given in the preliminary engineering study, which applicants for new-source permits are required to submit, is used to model changes in air quality caused by the proposed new source. Based on the information about the new source, results of the modeling of air quality, and preceding monitoring data, a construction permit is either permitted or denied. Permits set limits on the amount of various air pollutants allowed and may require monitoring of the source. The permits normally require application of the

best available control technology for each pollutant involved, and each new major source is required to meet the lowest achievable emission rate for that source type. These requirements become part of the compliance provisions that are monitored and enforced. For nonattainment areas, a new source may be required to formulate a strategy for protection of air quality through methods such as banked credits, emission offsets, modification of major sources that have no emission offsets or banked credits, or combinations of these practices.

Air quality monitoring. Air quality monitoring stations have been established by the Division of Air Pollution Control, TVA, and Alabama Power Company. For source polluters, a monitoring program may be incorporated into permit requirements. The Enforcement Program is responsible for compliance inspection and testing of permitted sources. Monitoring information is used to model changes in air quality. Figures VIII.1 show the location of these stations (pp I-112, II-88, III-84, IV-116, and V-99). Tables VIII.4 and VIII.5 list the information available for sulfur dioxide, total suspended particulates, and sulfates.

Hazardous wastes

Management. Hazardous waste management in Alabama is regulated under terms of the Hazardous Waste Management Act of 1978. Regulations implementing the Act have been set out and are administered by the Division of Solid and Hazardous Waste of the Alabama Department of Public Health (Alabama Department of Public Health, "Hazardous Waste Management Regulations," 1982).

Alabama has generally adopted the Federal requirements and guidelines in regard to permits, listing, and identification of hazardous materials, hazardous waste generators, transporters, storage, and treatment and disposal facilities. The differences between the hazardous waste control rules of EPA (see pages 118-122) and those of Alabama deal with permitting of hazardous waste transporters, reporting of hazardous waste spills, and shipping requirements.

All transporters of hazardous wastes must receive permits from the Department of Public Health. Shipments of hazardous wastes must comply with all Department of Transportation and State Public Service Commission regulations that deal with the manner in which the wastes are packaged and shipped ("Hazardous Waste Management Regulations," Sections 4-265 and 4-270). Prior to shipment (at least 2 weeks) notification must be given to the Department of Public Health, State Department of Public Safety, and the receiving facility

by the shipper of the wastes ("Hazardous Wastes Management Regulations," Section 4-250.01). Generators of hazardous wastes must file a report with the Department each year summarizing shipments for treatment, storage, or disposal within or outside the state or a copy of each manifest. Reports are also required for onsite treatment, storage, or disposal ("Hazardous Waste Management Regulations," Section 4-248.03). For onsite hazardous waste spills, the Department requires completion of a hazardous waste spill report and immediate notification of local authorities, the National Response Center, the US Coast Guard, and the Department of Environmental Management ("Hazardous Waste Management Regulations," Section 4-251).

Notification of hazardous waste generation. Generators of hazardous wastes must notify the Department of Public Health after it has been determined that hazardous wastes will be produced, based on one of the above rationales. (Operators of underground injection wells use other forms applicable to their activities.)

Radioactive materials

The use, storage, and transportation of radioactive materials are regulated by the EPA and by Alabama law (Rules of the State Board of Health for Radiation Protection, Rule 420-3-26). The Division of Radiological Health in the Department of Public Health is responsible for regulating use and disposal of radioactive materials. Alabama participates in the Southeast Interstate Low-Level Radioactive Waste Compact.

Licenses. Two types of licenses are issued: general and specific. General licenses are issued for use and transfer of radioactive source material by commercial and industrial firms; research, educational, and medical institutions; and state and local governmental agencies. The limits of the general license are that not more than 15 lb (6.8 kg) can be transferred at one time and not more than 150 lb (68 kg) can be received in 1 year. More intensive uses of radioactive materials or radioactive components require a specific license. Specific licenses include licenses to manufacture, assemble, repair, or distribute commodities, products, or devices that contain radioactive material (Rule 420-3-26-.02: Licensing, Parts 3(A), 5-8).

Transportation, disposal, and reporting. Transportation of radioactive materials must be licensed by the Department of Public Health. US Department of Transportation regulations are followed to ensure the safety of radioactive packages for transportation. Advance notice of transportation for materials

must be given to the Department for certain categories of radioactive materials (Rule 420-3-26-.02: Licensing, Parts 21-25).

Commercial or other establishments that hold general or specific licenses are required to report incidents of overexposure and excessive levels and concentrations of radiation to the Department (Rule 420-3-26-.03: Standards for Protection Against Radiation, Parts 10, 25, and 26).

Radioactive materials must be disposed of in a manner to protect human health. Restrictions and conditions are placed on disposal, i.e., burial, sewage disposal, land disposal, and incineration, of radioactive materials (Rule 420-3-26-03: Standards for Protection Against Radiation, Parts 16-21).

Contact. Information concerning use, storage, and transportation of radioactive materials in Alabama can be obtained from the following:

Department of Public Health
Division of Radiological Health
State Office Building
Montgomery, AL 36130
(205) 832-5992

Pesticides

The use and disposal of pesticides is regulated by EPA under the FIFRA and by the Alabama Department of Agriculture and Industries.

Registration. Pesticides distributed or sold within Alabama must be registered with the Department of Agriculture and Industries. The Department must be notified of any experimental pesticides distributed in the state (Agricultural Chemistry Regulation No. 2, Section 7; Registration, Rules A-B). Under EPA regulations, registration of a pesticide with the Regional EPA Administrator is also required before a pesticide may be distributed, sold, shipped, or delivered.

Use. Pesticide use is restricted by the classification (general or restricted) determined by EPA, by Alabama law, and by permit requirements for experimental use. At the time of registration, the permitted uses are determined by the EPA (40 CFR Section 162). The Alabama Department of Agriculture and Industry has identified restricted use pesticides that it regulates (Regulation 80-1-15). Purchase or use of a restricted use pesticide requires a permit from the Department. Pesticide applicator permits are required for both private and commercial applications of restricted and unrestricted pesticides. Private applicator permits are for use on the property owned by the applicant (Agricultural Chemistry Regulation No. 2).

Solid waste disposal

The Division of Solid Waste and Vector Control, State Department of Public Health, is responsible for administration of solid waste regulation in Alabama.

Preoperation notification and approval. Prior to construction and operation of a solid waste disposal or processing facility, the Division must be notified and approval must be obtained. Submission of plans for the facility may be required by the Division. If a private firm or agency is proposing the facility, a letter supporting the proposal must be submitted from the local governmental agency with jurisdiction over the area of the proposed facility (Rules and Regulations for Solid Waste Management, Sections VII-IX).

Operations. Regulation of storage of solid wastes and operation of solid wastes facilities is limited to specification of storage and transportation containers and operational standards for landfill facilities. Garbage and putrescible (decaying) animal and vegetable wastes are to be stored in containers that protect human health, i.e., rodent and fly proof, water tight, and sturdy construction. Transportation of the solid wastes is to be in containers and vehicles that similarly safeguard public health, i.e., leak proof and covered (Rules and Regulations for Solid Waste Management, Sections V-VI).

Sanitary landfills are operated to protect public health and prevent air and water pollution (Standards for the Disposal of Solid Wastes, A-HE-80). Landfills are to be accessible by an all-weather road. Water and shelter facilities are to be available. Sufficient, suitable cover material should be available at all sites. Wastes are to be compacted on arrival to a daily thickness of 2 ft (0.6 m) and covered with 6 in. (15 cm) of soil. Final contouring of the compacted material should be done in such a manner as to prevent washing or puddling from surface water. Landfill sites should not cause surface- or ground-water pollution. Solid wastes are not to be placed in the water table.

Air pollution is minimized because approval must be obtained for open burning of nonputrescible refuse and open burning of garbage is prohibited. Measures to prevent blowing litter should be used.

Contact. Information concerning solid waste disposal in Alabama is available from:

Division of Solid Waste and Vector Control
State Department of Public Health
State Office Building
Montgomery, AL 36130

Noise

The State of Alabama has no state laws regulating noise; the Federal statutes provide the standards. The Alabama Air Pollution Control Commission is responsible for rail and motor traffic, including enforcement of Federal noise emission standards.

Tennessee Legal Review

Water quality

Standards. The water quality standards are summarized in the Environmental Inventories (pp VIII-59 and IX-61). Future actions within the Corridor are affected by these standards because water quality conditions are monitored and violations handled by the Tennessee Division of Water Quality Control. The water quality standards are based on the intended use of the water; i.e., the water quality standards for drinking water are more stringent than those for other purposes and represent the contaminant levels for community and non-community water systems. The other criteria are standards for discharges into waters designated for fish and aquatic life; recreation; and irrigation, navigation, and livestock watering.

Application of the standards. Streams or stream segments have been classified as suitable for different uses (Tables VII.2, pp VIII-61 and IX-63). The standards apply to those designated stream uses. Discharges must comply with the discharge standards for the receiving water's designated use(s). New discharges must have permits prior to discharge.

Water quality planning. Tennessee counties in the Corridor are within the Tennessee River Western Valley Basin planning area (Tennessee Department of Public Health 1978). The basinwide Section 208 plans contain information on stream use classifications and water quality information. Salient information is included in the Environmental Inventories, as outlined below.

Topic	Environmental Inventories	
Stream Use Classification - Tables VII.2	VIII-61	IX-63
Permit Criteria for Municipal and Other Domestic Wastewater Dischargers - Table VII.6	VIII-68	IX-72
Municipal and Domestic Wastewater Sources and Type Treatment - Table VII.5	VIII-67	IX-70
Industrial Waste Treatment - Tables VII.7	VIII-69	IX-74
Stream Segment Classification and Waste Load Allocation - Tables VII.8	VIII-72	IX-80

Trends in water quality are documented biannually, as required by Section 305b of the Clean Water Act. These reports document the water quality monitoring system and show trends in water quality by examining changes in the water quality parameters (Tennessee Department of Public Health 1982). The 305b report specifically identifies various water quality problems including: public sewerage system problems, flooding problems, ground-water problems, and drinking water problems. Appendixes A (pp VIII-99, IX-III) of the Inventories contain summary information on water quality monitoring for water temperature, dissolved oxygen, biological oxygen demand, pH, and turbidity. Water quality monitoring information is available through EPA's STORET system and the US Geological Survey's WATSTORE systems (see Resource Inventories for access information).

Permitting process required for discharges. Any anticipated new point source discharges of wastewater must be approved by attaining an NPDES permit. The permits and the conditions required by them are based on stream segments and the water quality existing in the segment and the sources that are already discharging into the segment. Each discharger, through the permitting process, is assigned a waste load allocation.* The waste load allocation is

* A waste load allocation is that portion of the total maximum daily load which is allocated to a discharger located on a particular stream segment. The total maximum daily load is defined as the total maximum load, usually expressed in pounds per day, of pollutants allowable by water quality standards under a given set of flow and temperature conditions.

the amount of pollution the new discharger is allowed to add to the stream segment.

Permit applications require dischargers to show discharge volumes and planned treatment for discharges. The Department of Public Health then uses a water quality model to determine the change in water quality in that stream segment due to the additional discharge. The model uses the 20-year, 3-day low flow, and the velocity, slope, point source dischargers, and design flows to calculate change in water quality. The model assumes best practicable treatment (BPT) for municipalities and best conventional treatment (BCT) for industries. Using the model and permit application information on anticipated discharge and treatment levels, the water quality changes are calculated. If the model calculations show that no violations of water quality standards occur with the treatment levels, then they are recommended for the permit. If violations would occur, more stringent treatment levels are used in the model to calculate the water quality changes. The treatment levels are adjusted (i.e., more advanced treatment levels used) until no violations of standards are indicated.

New discharges to streams. To protect stream water quality, all point source polluters must receive discharge permits. The permit program is administered by:

Division of Water Quality Control
621 Cordell Hull Building
Nashville, TN 37219

The permit program is part of the NPDES administered by the EPA. The NPDES permit program is intended to maintain existing good water quality, or to improve water quality conditions in degraded streams. The permit system achieves these goals by limiting pollutant loads and requiring treatment of discharges to reduce pollutant loads. Before a new point source is allowed to discharge into a stream, a permit application must be processed. The permit given to the discharger sets limits on the amount of pollutants allowed for the subject discharge. Permits are required for municipal, manufacturing, wholesale and retail commercial, navigation, and other commercial dischargers.

Drinking water standards-physical and chemical characteristics. The maximum contaminant levels of inorganic chemicals for community water systems are given in Table 28 below. The maximum contaminant level for nitrate given in Table 28 is applicable to noncommunity water systems also. The maximum

Table 28

Maximum Contaminant Levels for Inorganic Chemicals

Substance	Concentration mg/ℓ
Arsenic	0.05
Barium	1.0
Cadmium	0.010
Chromium	0.05
Fluoride*	2.0
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.0
Selenium	0.01
Silver	0.05

* Public water systems that adjust the fluoride content shall maintain the concentration of fluoride in the finished water between 0.8 mg/ℓ and 1.3 mg/ℓ.

organic contaminant levels for community water systems are given in Table 29.

Community and noncommunity water systems using surface-water sources in whole or in part shall not exceed 1 turbidity unit, as determined by a monthly average of daily samples. Furthermore, community water systems using groundwater formations, other than approval sand and gravel formations, must comply with this limit. The Department may grant variances and exemptions from primary drinking water regulations.

Secondary drinking water maximum contaminant levels (Table 30) have been established to provide an aesthetically pleasing water to the consumer. These standards apply to all community water systems and to those noncommunity water systems as deemed necessary by the Department.

Criteria for fish and aquatic life. No sewage, industrial wastes, or other wastes shall be discharged that result in waters labeled for fish and aquatic life failing to meet these criteria:

a. Dissolved oxygen shall be maintained at 5.0 mg/ℓ except in limited sections; dissolved oxygen shall be at least 3.0 mg/ℓ.

b. pH shall be between 6.5 and 8.5 and shall not fluctuate more than 1 unit in this range in any 24 hr.

Table 29

Maximum Contaminant Levels of Organic Chemicals

Contaminant	Level mg/ℓ
Chlorinated hydrocarbons	
Endrin (1,2,3,4,10, 10-hexachloro-6, 7-epoxy-1,4, 4/A,5,6,7,8,8/A-octa-hydro-1,4,-endo, endo 5,8 - di-methano napthalene)	0.0002
Lindane (1,2,3,4,5,6,-hexachlorocyclohexane, gamma isomer)	0.0004
Methoxychlor (1,1,1-trichloro-2, 2-bis [P-methoxyphenyl] ethane	0.1
Toxaphene (C10/H10/C18-technical chlorinated camphene, 67-69 percent chlorine)	0.0005
Chlorophenoxys	
2,4-D, (2,4-D dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	0.01

Table 30

Maximum Secondary Drinking Water Contaminant Levels

Contaminant	Level
Hardness	150 mg/ℓ
Chloride	250 mg/ℓ
Color	15 color units
Copper	1
Methyl blue active substance	0.5 mg/ℓ
Iron	0.3 mg/ℓ
Manganese	0.05 mg/ℓ
Odor	3 threshold odor number
pH	6.5-8.5
Sulfate	250 mg/ℓ
Total dissolved solids	500 mg/ℓ
Zinc	5 mg/ℓ

c. Solids, floating materials, and deposits--no distinctly visible solids, scum, foam, oily sleek, and no formation of slimes, bottom deposits, or sludge banks that may be detrimental to fish or aquatic life.

d. Turbidity or color--none added in amounts or of such character that will materially affect fish and aquatic life.

e. Temperature--the maximum water temperature change shall not exceed 3° C relative to an upstream control point. The water temperature shall not exceed 30.5° C, and the maximum rate of change shall not exceed 2° C per hour. For trout waters, the temperature shall not exceed 20° C and there shall be no unnatural temperature changes.

f. Taste or odor--no substances shall be added which will make fish unpalatable or which will result in offensive odors.

g. Toxic substances or other pollutants--none added that will affect fish and aquatic life.

h. The concentration of the fecal coliform group shall not exceed 1,000 per 100 ml as the logarithmic mean based on at least 10 samples collected over 30 days. The fecal coliform concentration in any one sample shall not exceed 5,000 per 100 ml.

Criteria for recreational waters. No sewage, industrial wastes, or other wastes shall be discharged that result in waters designated for recreational use failing to meet these criteria:

a. Dissolved oxygen--always present in sufficient quantities to prevent odors of decomposition and other offensive conditions.

b. pH shall be between 6.0 and 9.0 and shall not fluctuate more than 1.0 within this range.

c. Solids, floating material, and deposits--no distinctly visible solids, scum, foam, oily sleek, and no formation of slimes, bottom deposits, or sludge banks of such size or character that may be detrimental to recreation.

d. Turbidity or color--none added in amounts or character that will result in an objectionable appearance of the water.

e. Temperature--shall not be 3° C over an upstream control point and shall not be over 30.5° C, and the maximum rate of change shall not exceed 2° C per hour.

f. Microbiological coliforms--fecal coliform group shall not exceed 200 per 100 ml as the logarithmic mean based on at least 10 samples monthly average value, collected over 30 days. The fecal coliform concentration in any sample must not exceed 1,000 per 100 ml.

g. Taste or odor--no substances added that will result in objectionable taste or odor.

h. Toxic substances or other pollutants--none added to the water which will produce toxic conditions that affect man or animal or have a detrimental effect on recreation.

Criteria for water used for irrigation, navigation, and livestock watering. No sewage, industrial wastes, or other wastes shall be discharged that result in waters designated for use for livestock, watering, irrigation, or navigation failing to meet these criteria:

a. Dissolved oxygen--present in sufficient quantities to prevent odors of decomposition and other offensive conditions.

b. pH--except for navigation, shall be between 6.0 and 9.0 and shall not fluctuate more than 1.0 unit in this range in 24 hr.

c. Hardness or mineral compounds--no substances added which will impair use of water for its designated purpose.

d. Solids, floating material, and deposits--no distinctly visible solids, scum, foam, oily sleek, and no formation of slimes, bottom deposits, or sludge banks that impair the use of water for its designated purpose.

e. Temperature--shall not be raised or lowered to an extent that will interfere with the designated purpose of the water.

f. Toxic substances or ether pollutants--none added that will produce toxic conditions or be detrimental to the designated purpose of the water.

Air quality

Tennessee and the Clean Air Act. As required by the Clean Air Act of 1970 and the 1977 amendments, Alabama developed a State Implementation Plan (SIP) for attaining the clean air goals of the Act. The Tennessee Air Quality Act established the Tennessee Air Pollution Control Board for the prevention and abatement of air pollution. The Board administers the SIP. Protection of air quality has been accomplished by establishing air quality standards, classifying areas according to air quality, limiting or regulating construction of new sources of pollution, and monitoring air quality (Tennessee Air Pollution Control Board (TAPCB) 1984).

Standards. Tennessee and National Ambient Air Quality Standards (see Table 15) are the same, and are presented in Table VIII.1 on pp VIII-78 and IX-88.

Air quality control regions. As discussed, EPA classified the AQCRs as Classes I-III. In Tennessee, there are no Class I areas in the Corridor region. All counties in the Tennessee Corridor are Class II.

Air quality in the Tennessee Corridor area. Air quality in the Tennessee part of the Corridor is generally good. There is one nonattainment area, around New Johnsonville. This area contains portions of Benton and Humphreys Counties near TVA's New Johnsonville Steam Plant. The power plant violates

the sulfur dioxide emission limitation contained in the SIP for coal-fired power plants (IX-93, Environmental Inventories).

New-source pollution. General classes of major sources of air pollution are listed in Table VIII.3 (pages VIII-81 and IX-91). The permit applicant must demonstrate that the proposed new source will not cause pollutant concentrations in excess of:

a. Ambient air quality standards (Table VIII.1, pp VIII-78 and IX-88.

b. New source performance standards (NSPS) for that major source category.

c. National hazardous emission standards (same as NSPS for Tennessee).

New emission sources or modifications to emissions that are significant are regulated by Prevention of Significant Deterioration (PSD) review. Emission increases that are below the rates given in Table 16 are considered insignificant. If the increase in a pollutant caused by a new source or modification is below the de minimis levels (Table 17), the monitoring and analysis requirements in the permit application can be waived by the EPA.

The information given in the preliminary engineering study, which applicants for new-source permits are required to submit, is used by the Board to model changes in air quality caused by the proposed new source. Based on the information about the new source, results of the modeling of air quality, and preceding monitoring data, a construction permit is either permitted or denied. Permits set limits on the amount of various air pollutants allowed and set monitoring requirements for the source. The permits normally require application of the best available control technology for each pollutant involved, and each new major source is required to meet the lowest achievable emission rate for that source type. These requirements become part of the compliance provisions that are monitored and enforced by the Board. Figure 6 shows the permitting process. For nonattainment areas, a new source may be required to formulate a strategy for protection of air quality through methods such as banked credits, emission offsets, modification of major sources that have no emission offsets or banked credits, or combinations of these practices (TAPCB 1984).

Air quality monitoring. Air quality monitoring is the responsibility of the Technical Services Program of the Board. Ambient air quality is monitored at specific monitoring stations. For source polluters, a monitoring program may be incorporated into permit requirements. The Enforcement Program

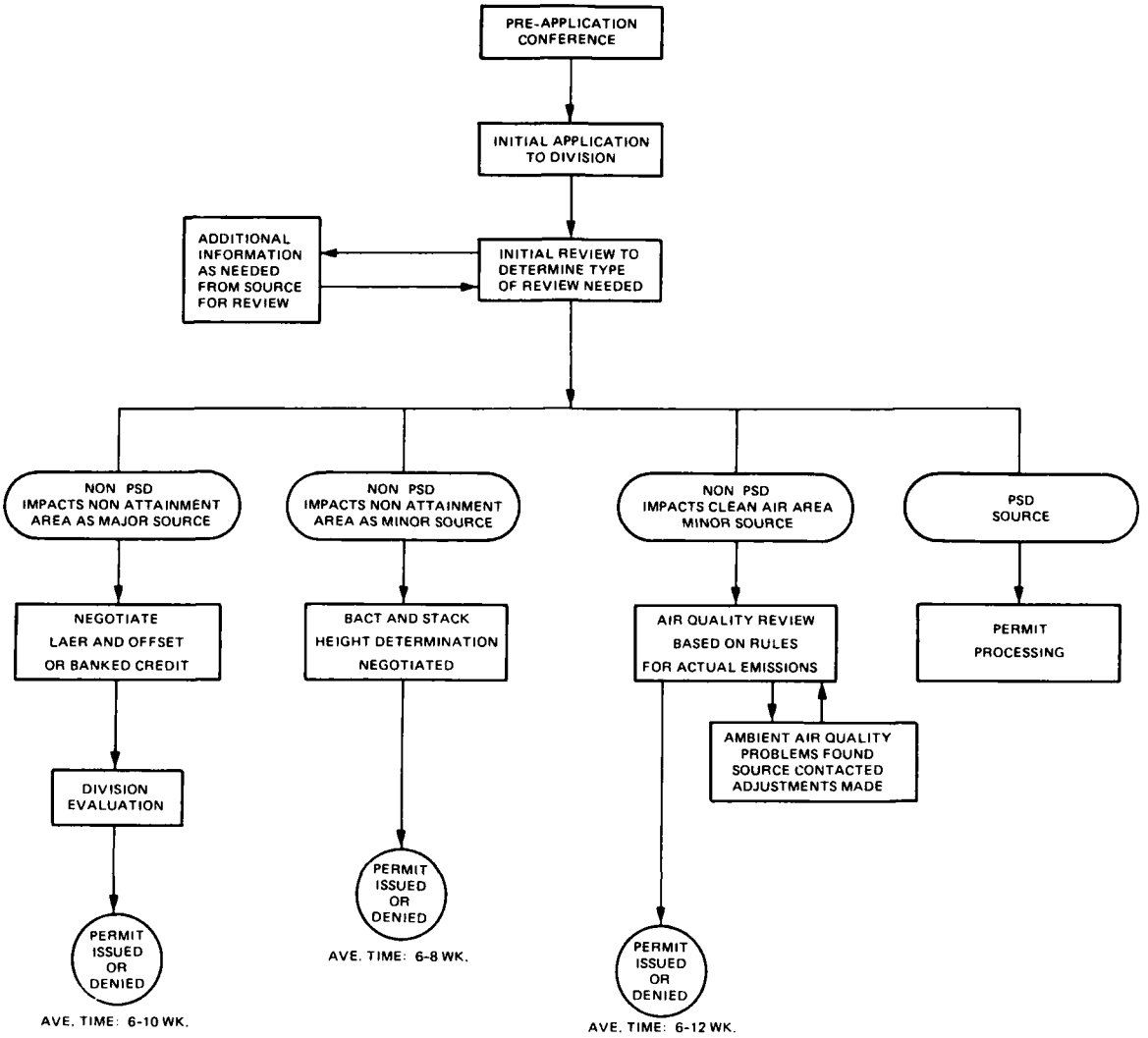

Figure 6. Permitting process (adapted from TAPCB 1984)

is responsible for compliance, inspection, and testing of permitted sources. Monitoring information is used by Technical Services to model changes in air quality. In the Tennessee Corridor area, there are no state air quality monitoring stations. However, TVA maintains a series of monitoring stations that can provide air quality information. Figure VIII.1 (pages VIII-84 and IX-94) shows the location of these stations, and Table VIII.4 (pages VIII-85 and IX-95) lists the information available for sulfur dioxide, total suspended particulates, and sulfates.

Hazardous wastes

Management. Hazardous waste management in Tennessee is regulated under terms of Tennessee's Hazardous Waste Management Acts of 1977 and 1983. The

1983 Act is known as the State Superfund Act and provides for expenditure of funds for investigation, cleanup, monitoring, and enforcement programs for hazardous wastes. The Commissioner of Health and the Environment and the Division of Solid and Hazardous Wastes (Department of Public Health) are responsible for administration of the Acts (Speer and Bulanowski 1984).

Permits. The storage and/or treatment of hazardous wastes require a State permit. Permits for onsite treatment facilities, i.e., treatment of waste at the site of generation, are issued by the Commissioner. Offsite treatment facilities are permitted by the Solid Waste Disposal Control Board. Under terms of the State Superfund Act, local approval is required before the Board can issue a permit for a commercial landfill. Local governments are required to hold public meetings on hearings prior to the Board's actions.* After establishment of a landfill, the local government can levy an additional fee on the disposal of hazardous wastes disposed of at a facility within its jurisdiction (Speer and Bulanowski 1984).

Questions regarding hazardous waste disposal in Tennessee should be addressed to:

Division of Solid and Hazardous Wastes
150 Ninth Avenue, N
TERRA Building
Nashville, TN 37203
(615) 741-3424 (Mr. Dwight Hinch)

Notification of hazardous waste generation. Generators of hazardous wastes must notify the Division of Solid and Hazardous Wastes after it has been determined that hazardous wastes will be produced, based on one of the above rationales. EPA Form 8700-12 is used as official notification by generators, transporters, and operators of hazardous waste facilities. (Operators of underground injection wells use other forms applicable to their activities.)

Radioactive materials

The use, storage, and transportation of radioactive materials are regulated by Tennessee law (State Regulations for Protection Against Radiation, Chap. 1200-2). The Division of Radiological Health, part of the Department of Public Health, is responsible for regulating radioactive material. The

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* Personal Communication, 1984, Dwight Hinch, Division of Solid and Hazardous Wastes, Nashville, Tenn.

labeling requirements require information on the registrant producing the pesticide, the ingredients, directions for use, and use classification (40 CFR 162). Tennessee labeling requirements are limited to the name and concentration of the pesticide (21 TCA Section 62-2117).

Use. Pesticide use is restricted by the classification (general or restricted) determined by EPA, by Tennessee law, and by permit requirements for experimental use. At the time of registration, the permitted uses are determined by the EPA (40 CFR Section 162). Tennessee law requires that commercial applicators, e.g., pest control companies, be certified in application of restricted use pesticides (Sections 0080-6-16-.01, 0080-6-16-.03 (1, 4(1-1-1)), (0080-6-16-.04 and 0080-6-16-.07). Experimental use permits are required for large-scale testing of pesticides. Permits are required for the experimental use of unregistered pesticides or for a previously unapproved use of a registered pesticide. Laboratory, greenhouse, or small area (10 acres (4 ha) or less) applications are exempted from permit requirements (40 CFR Section 172.2-.6 and 172.8).

Solid waste disposal

The Division of Environmental Sanitation, Tennessee Department of Public Health, is responsible for administration of solid waste regulations.

Planning and construction. Prior to construction of a new solid waste disposal system, the Department of Public Health must approve plans for the facility. A feasibility study is submitted detailing information on the service area such as political entities, population densities, and economic conditions. The feasibility study includes data on major solid waste producers and waste facilities already serving the area. Future changes in population and industrial development should be examined. An analysis of available alternatives should also be included (Rule 1200-1-7-.04). Design and construction plans are submitted to the Board for approval. The Board has standards for such measures as incinerators and composting plants. These standards are used to evaluate the plans for approval (Rule 1200-1-7.05(1) and (2)).

The following are the criteria used by the Board for site approval of sanitary landfills (Rule 1200-1-7.05(3)):

a. The site shall not be subject to flooding, and geologic conditions must be such as not to permit pollution of ground water.

b. Soil cover or other material must be readily available.

c. All-weather roads must be provided.

affected by these standards because water quality conditions are monitored and violations are handled by the Division of Water in the Department of Environmental Protection, Natural Resources and Environmental Protection Cabinet. The water quality standards are based on the intended use of the water, e.g., the water quality standards for drinking water are more stringent than those for navigation purposes.

Kentucky has formulated a strong nondegradation policy for surface water. The policy is intended to protect the waters of the Commonwealth of Kentucky for their designated uses, to prevent the creation of any new pollution, and to abate any existing pollution. Pursuant to this policy, minimum water quality criteria applicable to all waters and criteria for specific uses of water have been developed.

References to the Department should be interpreted as the Division of Water (previously in the Department for Natural Resources and Environmental Protection). The drinking water standards are the contaminant levels for public and semipublic water systems. The other water quality criteria are standards for waters designated for surface water, aquatic life, agricultural use, and recreation.

Water quality planning. Information needed to prepare the basinwide water quality plans (Section 208 plans) is included in the Environmental Inventories, as outlined below.

Topic	Environmental Inventory
Municipal Wastewater Sources and Type Treatment - Table VII.4	X-62
Domestic Wastewater Sources and Type Treatment - Table VII.5	X-67
Industrial Water Treatment - Table VII.6	X-69
Stream Segment Description and Water Quality Status - Table VII.7	X-74
Waste Load Allocation - Table VII.8	X-76

Trends in water quality are documented biannually, as required by Section 305b of the Clean Water Act. These reports document the water quality monitoring system and show trends in water quality by examining changes in the water quality parameters. The 305b report specifically identifies various

water quality problems including: public sewerage system problems, flooding problems, ground-water problems, and drinking water problems. Appendixes A (page X-113) of the Inventories contain summary information on water quality monitoring for water temperature, dissolved oxygen, pH, and turbidity. Water quality monitoring information is available through EPA's STORET and the US Geological Survey's WATSTORE systems (see Resource Inventories for access information).

Permitting process required for discharges. Any anticipated new point source discharges of wastewater must be approved by obtaining a permit from the Division of Water. The Kentucky Pollutant Discharge Elimination System administers the NPDES program in Kentucky (401 Kentucky Administrative Regulations (KAR) 5:050-085). The permits and the conditions required by them are based on stream segments and the water quality existing in the segment and the sources that are already discharging into the segment. Each discharger, through the permitting process, is assigned a waste load allocation.* The waste load allocation is the amount of pollution the new discharger is allowed to add to the stream segment. A copy of a permit application is included as Figure 7. There are separate application forms for municipal wastewater discharges; animal waste management; manufacturing and mining; and services, wholesale and retail trade, and all other establishments.

Permit applications require dischargers to show discharge volumes and planned treatment for discharges. The Division then uses a water quality model to determine the change in water quality in that stream segment due to the additional discharge. The model uses the 10-year, 7-day low flow, and the stream velocity, slope, point source dischargers, reaeration rates, and design flows to calculate change in water quality. The model assumes best practicable treatment for municipalities and best conventional treatment for industries. Using the model and permit application information on anticipated discharge and treatment levels, the water quality changes are calculated. If the model calculations show that no violations of water quality standards occur with the treatment levels, they are recommended for the permit. If violations

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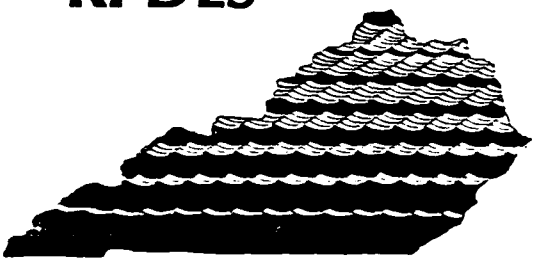
* A waste load allocation is that portion of the maximum theoretical daily load which is allocated to a discharger located on a particular stream segment. The maximum theoretical daily load is defined as the total maximum load, usually expressed in pounds per day, of pollutants allowable by water quality standards under a given set of flow and temperature conditions.

KPDES



Kentucky Pollutant Discharge Elimination System

Permit Application

This is an application to: (✓ One)
1. Apply for a new permit ..... ☐
2. Apply for a reissuance of expiring permit .. ☐
3. Modify an existing permit ..... ☐

A complete application consists of this form and one of the following: Form A; Form B; Form C; or Short Form C.

FORM 1

I. FACILITY CONTACT INFORMATION

AGENCY USE

A. _____
Name of business, municipality, company, etc. requesting permit.

B. Facility Address

_____
Primary mailing name

_____
Primary mailing street

_____
Primary mailing city *State* *Zip code*

II. FACILITY DESCRIPTION

A. _____
Provide a brief description of activities, products, etc.

B. Standard Industrial Classification (SIC) Code and Description

Principle SIC Code: _____
Code *Description*

Other SIC Code(s): _____

III. FACILITY LOCATION

A. Attach a U.S. Geological Survey 7½ minute quadrangle map for the site.

_____ _____
County where facility is located *City where facility is located (if applicable)*

C. _____
Body of water receiving discharge

D. Facility Site: _____ _____ Discharge Site: _____ _____
Latitude *Longitude* *Latitude* *Longitude*

DEP7032 (10/83)

Figure 7. Permit application form (Continued)

IV. OWNER/OPERATOR INFORMATION

A. _____
Type of ownership (See instructions for choices)

B. Operator Contact information.

_____ _____
Operator mailing name *Telephone number*

_____
Operator mailing street

_____
Operator mailing city *State* *Zip code*

C. Is the operator also the owner? ☐ Yes ☐ No

D. Is the operator certified? ☐ Yes ☐ No (If yes, list certification below)

_____ _____
Certification class *Certification number*

V. EXISTING ENVIRONMENTAL PERMITS

A. _____ _____ _____
Current NPDES number *Issue date of current permit* *Expiration date of current permit*

_____ _____
Number of times permit reissued *Date of original permit issuance*

B. _____ _____ _____
Kentucky DOW operational permit number *Ky. Dept. for Surface Mining permit number(s)*

VI. DISCHARGE MONITORING REPORTS (DMR's)

KPDES permit holders are required to submit DMR's to the Division of Water on a regular schedule (as defined by the KPDES permit). The information in this section serves to specifically identify the department, office or individual responsible for submitting DMR forms to the Division of Water.

A. _____ _____
Name of department, office or official submitting DMR's *Telephone number*

B. Address where DMR forms are to be sent. *(Complete only if address is different from facility address in Section I)*

_____
DMR mailing name

_____
DMR mailing street

_____
DMR mailing city *State* *Zip code*

VII. APPLICATION FILING FEE

KPDES regulations require that a permit applicant pay and application filing fee equal to twenty percent of the permit base fee. Please examine the base and filing fee listed in the Form 1 instructions and enclose a check payable to the "Kentucky State Treasurer" for the appropriate amount.

A. _____ $ _____
Facility category *Filing fee enclosed*

VIII. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

_____ _____
Name *Title*

_____ _____
Signature *Date*

Figure 7. (Concluded)

would occur, more stringent treatment levels are used in the model to calculate the water quality changes. The treatment levels are adjusted (i.e., more advanced treatment levels used) until no violations of standards are indicated.

Minimum criteria for surface water. Surface waters (including mixing zones) are not to be aesthetically or otherwise degraded by substances that:

a. Settle to form objectionable deposits.

b. Float as debris, scum, oil, etc.

c. Produce objectionable color, odor, taste, or turbidity.

d. Have adverse effects on humans or aquatic organisms.

e. Produce undesirable aquatic life or the dominance of nuisance species.

f. Cause the following changes:

(1) The gross total alpha particle activity (including radium-226 but excluding radon and uranium) to exceed 15 PCI/ℓ.

(2) The combined radium-226 and radium-228 to exceed 5 PCI/ℓ (specific determinations of radium-226 and -228 are not necessary if dissolved gross particle activity does not exceed 5 PCI/ℓ.

(3) The concentration of total gross beta particle activity to exceed 50 PCI/ℓ.

(4) The concentration of tritium to exceed 20,000 PCI/ℓ.

(5) The concentration of total strontium-90 to exceed 8 PCI/ℓ.

Surface waters may be classified for one or more of the following uses: agricultural use, aquatic life, domestic water supply, recreational waters, and outstanding resource waters.

Drinking water standards-physical and chemical characteristics. The maximum contaminant levels of inorganic chemicals for community water systems are given in Table 31. The maximum contaminant level for nitrate given in Table 31 is applicable to noncommunity water systems also. Community water systems using surface sources shall sample for the presence of inorganic chemicals each year, with the first sampling completed by 24 June 1978; community water systems using ground-water sources shall sample each 3 years with the initial sampling completed by 24 June 1979; and noncommunity water systems shall sample nitrates once each 3 years with the initial sampling completed by 24 June 1979.

The maximum organic contaminant levels for community water systems that obtain all or part of their water from surface-water sources and for

Department-specified systems that obtain their water from ground-water sources are given in Table 32. Sampling for organic chemicals shall be done no less than once each 3 years at a Department-specified time, with the initial sampling completed by 24 June 1978.

The maximum contaminant levels for fluoride applicable to community water systems are given in Table 33 below.

Table 31

Maximum Contaminant Levels for Inorganic Chemicals

Substance	Concentration mg/ℓ
Arsenic	0.05
Barium	1.0
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.0
Selenium	0.01
Silver	0.05

Community and noncommunity water systems using surface-water sources in whole or in part shall not exceed 1 turbidity unit, measured at a representative entry point to the distribution system, except that 5 or fewer turbidity units may be allowed if the supplier of water can demonstrate that the higher turbidity will not interfere with the disinfection or microbiological determinations. Five turbidity units may be allowed based on an average for 2 consecutive days. Systems that purchase water from other sources or obtain all of their water from ground-water sources or semipublic systems are not subject to these turbidity requirements. Samples shall be taken one each day at each producing facility.

A variance may be granted by the Department if a written request is submitted and it is determined that public health will be protected. Exemptions may be granted if compliance is deemed impossible due to compelling factors

Table 32

Maximum Organic Contaminant Levels

Contaminant	Level, mg/ℓ
Chlorinated hydrocarbons	
Endrin (1,2,3,4,10, 10-hexachloro-6, 7-epoxy-1,4, 4/A,5,6,7,8,8/A-octa-hydro-1,4,-endo, endo 5,8 - di-methano napthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-trichloro-2, 2-bis [P-methoxyphenyl] ethane)	0.1
Toxaphene (C10/H10/C18-technical chlorinated camphene, 67-69 percent chlorine)	0.005
Chlorophendxys	
2,4-D (2,4-D dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	0.01

Table 33

Maximum Contaminant Levels for Fluoride

Temperature, °F	Temperature, °C	Level mg/ℓ
53.7 and below	12.0 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

and the exemption will not result in an unreasonable risk to health.

Water quality for aquatic life. The following parameters are for the protection of warmwater aquatic communities:

a. Alkalinity (CaC03) shall not be reduced more than 25 percent, reduced to a degree to adversely affect aquatic life, or reduced below the level of 20 mg/ℓ.

b. pH shall not be less than 6.0, nor more than 9.0, and not fluctuate more than 1 unit in 24 hr.

c. Flow shall not be altered to a degree to adversely affect the aquatic community.

d. Temperature shall not exceed 31.7° C (89° F).

(1) Normal daily fluctuations in temperature shall be maintained.

(2) The maximum rise, for effects other than that of a mixing zone, shall not exceed the natural temperature by 2.8° C (5° F), with the rate of change no greater than 1° C (1.8° F) per hour. A variance may be granted upon submission of adequate supporting data on naturally occurring temperatures for a specific location. Table 34 delimits the water temperature for all surface waters.

(3) In impounded waters the increase is limited to 1.7° C (3° F), above the seasonal norm.

e. Dissolved oxygen:

(1) Minimum concentration should be 5 mg/ℓ; at no time should the instantaneous minimum be less than 4 mg/ℓ.

(2) It shall be at mid-depth in waters with a total depth of 10 ft (3 m) or less, and at 5 ft (1.5 m) for deeper waters.

f. Regarding solids, neither the amount of total dissolved solids nor the total suspended solids may be changed so as to adversely affect the indigenous aquatic community. Settable solids that may adversely alter the stream bottom are prohibited.

g. The concentration of ammonia in its un-ionized form shall not be greater than 0.05 mg/ℓ at any time instream after mixing, as illustrated in the table "Instream Ammonia-N Concentration" (available from the Kentucky Department of Environmental Protection).

h. Toxic substances and noncumulative and nonpersistent toxic materials shall not exceed 0.1 of the 96 LC50 of a representative indigenous aquatic organism. Specific parameters of maximum allowable concentrations are listed in Table 35.

Table 34

Stream Maximum Temperature for Each Month

Month	°F	°C
January	50	10.0
February	50	10.0
March	60	15.6
April	70	21.1
May	80	26.7

(Continued)

Table 34 (Concluded)

Month	°F	°C
June	87	30.6
July	89	31.7
August	89	31.7
September	87	30.6
October	78	25.6
November	70	21.1
December	57	13.9

Table 35

Warmwater Aquatic Habitat Criteria*

Contaminant	Maximum Concentration Level
Arsenic	50 µg/ℓ
Beryllium	11 µg/ℓ soft water**
	1,100 µg/ℓ hard water**
Cadmium	4.0 µg/ℓ soft water**
	12.0 µg/ℓ hard water**
Chlorine, total, residual	10 µg/ℓ
Chromium	100 µg/ℓ
Cyanide, free	5 µg/ℓ
Hydrogen sulfide (undissociated)	2 µg/ℓ
Iron	1.0 mg/ℓ†
Mercury	0.05 µg/ℓ
Phthalate esters	3 µg/ℓ
Phenol	5 µg/ℓ
Hexavalent	100 µg/ℓ

(Continued)

* Metal criteria, for purposes of this regulation, are total metals to be measured in an unfiltered sample.

** Soft water has an equivalent concentration of calcium carbonate ($CaCO_3$) of 0 to 75 mg/ℓ, and hard water has an equivalent concentration of calcium carbonate ($CaCO_3$) of over 75 mg/ℓ.

† For low-flow streams, the daily average total iron concentration is limited to 3.5 mg/ℓ when it is established that there will be no damage to aquatic life.

Table 35 (Concluded)

Contaminant	Maximum Concentration Level
Copper	0.1 times 96-hr LC50
Lead	0.01 times 96-hr LC50
Nickel	0.1 times 96-hr LC50
Selenium	0.01 times 96-hr LC50
Silver	0.01 times 96-hr LC50
Zinc	0.01 times 96-hr LC50
Organics	
Pesticides††	

†† Pesticides are considered toxic substances and are regulated according to toxic substance guidelines.

All criteria for warmwater aquatic life also apply for coldwater aquatic communities and "put and take" trout streams with the following additions:

a. Regarding dissolved oxygen:

(1) Minimum concentration of 6 mg/ℓ daily average and 5 mg/ℓ as an instantaneous minimum.

(2) For impoundments that support trout, the concentration of dissolved oxygen in waters below the epilimnion shall be kept consistent with natural water quality.

b. The temperature may not be increased above natural norms by man's activities.

c. Total residual chlorine shall not exceed 2 µg/ℓ as an instream value.

Water quality criteria for agricultural use. The values in Table 36 are the maximum allowable concentrations of substances necessary in streams for the protection of agricultural uses.

Table 36

Agricultural Criteria

Contamination	Maximum Contamination Level
Arsenic	0.1 mg/ℓ
Beryllium	0.1 mg/ℓ

(Continued)

Table 36 (Concluded)

Contamination	Maximum Contamination Level
Cadmium	0.05 mg/ℓ
Chromium, as hexavalent	0.1 mg/ℓ
Copper	0.2 mg/ℓ
Fluoride	2 mg/ℓ
Iron	3.5 mg/ℓ
Lead	0.1 mg/ℓ
Manganese*	0.2 mg/ℓ
Mercury	0.01 mg/ℓ
Nickel	0.2 mg/ℓ
Nitrates and nitrites (NO3 as N plus NO2 as N)	100 mg/ℓ
pH	6.0-9.0
Pesticides	
Chlordane	0.003 mg/ℓ
Chlorophenoxy Herbicides	
2,4-D	0.02 mg/ℓ
2,45-T	0.002 mg/ℓ
Silvex	0.03 mg/ℓ
Demeton	0.1 mg/ℓ
Endosulfan	0.1 mg/ℓ
Guthion	0.1 mg/ℓ
Heptachlor	0.1 mg/ℓ
Lindane	0.004 mg/ℓ
Malathion	0.1 mg/ℓ
Methoxychlor	0.1 mg/ℓ
Mirex	0.1 mg/ℓ
Parathion	0.1 mg/ℓ
Selenium	0.05 mg/ℓ
Zinc	2 mg/ℓ

* This standard is applicable only where agricultural lands are used to grow acidiphilic plants over extended periods of time, utilizing irrigation technology, and where soil pH is less than 6.0.

Water quality for recreational water and for outstanding resource waters. Criteria for recreational waters are as follows:

a. For primary contact recreation (water suitable for full-body contact recreation during season of 1 May through 31 October:

(1) Fecal coliform: not to exceed 200 colonies per 100 ml as a monthly geometric mean based on not less than five samples per month; nor exceed 400 colonies per 100 ml in more than 10 percent of all samples taken during the month.

(2) pH shall be between 6.0-9.0, and shall not change more than 1 pH unit per 24 hr.

b. For secondary contact recreation water (waters suitable for partial-body contact recreation, with a minimal threat to public health during season of 1 May through 1 October:

(1) Fecal coliform: not to exceed 5,000 colonies per 100 ml in more than 10 percent of the samples taken during any 30-day period.

(2) pH shall be between 6.0-9.0, and shall not change more than 1 pH unit for a period of 24 hr.

Criteria for outstanding water resources are applicable as follows:

a. Inclusion is automatic for any surface waters designated under the Kentucky Wild Rivers Act, the Kentucky Nature Preserves Act, or the Federal Wild and Scenic Rivers Act or that support federally recognized rare endangered species.

b. Certain rivers may also be presented to the Board for consideration to achieve this classification.

c. Variances are granted as follows: the Department may grant a variance to classification criteria upon demonstration that maintenance of water quality criteria now applicable are not attainable but the use classification is still appropriate. Analysis must show that the necessary water quality cannot reasonably be achieved due to economic and/or technological limitations and/or naturally occurring poor water quality. All exemptions will be temporary and subject to review every 3 years.

Air quality

Kentucky and the Clean Air Act. As required by the Clean Air Act of 1970 and 1977 amendments, Kentucky developed a State Implementation Plan (SIP) for attaining the clean air goals of the Act. The SIP for Kentucky is administered by the Division of Air Pollution Control, Department for Environmental Protection, Natural Department for Environmental Protection, Natural Resources and Environmental Protection Cabinet. Protection of air quality has been accomplished by establishing air quality standards, classifying areas according to air quality, limiting or regulating construction of new sources of pollution, and monitoring air quality.

Standards. Kentucky and National Ambient Air Quality Standards (see Table 15) are the same with the addition of Kentucky standards for hydrogen sulfide, gaseous fluorides, total fluorides, and odors. These standards are presented in the Environmental Inventories (Table VIII.1, page X-82).

Air quality control region. As discussed, EPA classified the AQCRs as Classes I-III. There are no Class I areas in the Kentucky Corridor region. All counties in the Kentucky Corridor are Class II.

Air quality in the Kentucky Corridor area. Air quality in the Kentucky part of the Corridor is generally good. Two counties are nonattainment areas: McCracken, for the primary standard for ozone, and Marshall, for the secondary standard for total suspended particulates (Computer Assisted Environmental Legislative Data System).

New-source pollution. There are some exceptions to the new source review requirements (401 KAR 50). General classes of major pollution sources are listed in Table VIII.3 (page X-85). The permit applicant must demonstrate that the proposed new source will not cause pollutant concentrations in excess of:

a. Ambient air quality standards (Table VIII.1, page X-82).

b. New source performance standards for that major source category.

c. National hazardous emission standards (401 KAR 63:20).

New emission sources or modifications to emissions that are significant are regulated by Prevention of Significant Deterioration (PSD) review. Emission increases that are below the rates given in Table 16 are considered insignificant. If the increase in a pollutant caused by a new source or modification is below the de minimis levels (Table 17), the monitoring and analysis requirements in the permit application can be waived by the EPA (and the Division).

Air quality monitoring. Ambient air quality is monitored at specific monitoring stations. For source polluters, performance testing is required after startup of operation (401 KAR 51:045, 50:050; 50:015). The Division of Air Pollution Control has air quality monitoring in all but two counties (Trigg and Lyon) in the Kentucky Corridor area. Figure VIII.1 (page X-88) shows the location of these stations and Table VIII.4 (page X-89) shows the information available for sulfur dioxide, total suspended particulates, and ozone.

Hazardous wastes

Hazardous Wastes are regulated by the Division of Waste Management, in the Department of Environmental Protection, Natural Resources and Environmental Protection Cabinet. Kentucky has developed more detailed regulations for hazardous wastes than the other Corridor states (Kentucky Waste Management Regulations, 401 KAR, 1983).

Identification. Industrial, agricultural, and commercial establishments that produce solid waste, sludge, garbage, or refuse could be subject to hazardous waste regulations. Normally the operation will be of such size or technical nature that the owners will be cognizant of applicability of hazardous wastes regulations. To determine applicability of hazardous wastes rules, the Division has established (1) lists of regulated hazardous wastes, (2) standards and tests to determine if an unlisted substance or waste is hazardous, and (3) lists of hazardous wastes produced by specific industries. These provisions are summarized in Table 37. The Division has established categories of exemptions for activities and substances.

For wastes or substances not listed, EPA has a set of tests to determine if a substance is subject to regulation as a hazardous substance. The tests are for (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity. The criteria for these properties are contained in 401 KAR 31:030. Wastes that exceed the limits or maximums for the tests are considered hazardous wastes.

Exclusions and special requirements. The Division has established special provisions for exclusions and for certain activities and small quantities of hazardous wastes (401 KAR 31:010). The exclusions and special requirement categories are listed in Table 38.

Notification of hazardous waste generation. Generators of hazardous wastes must notify the Division of Waste Management after it has been determined that hazardous wastes will be produced, based on one of the above rationales. EPA Form 8700-12 is used as official notification by generators, transporters, and operators of hazardous waste facilities (401 KAR 32:010). (Operators of underground injection wells use other forms applicable to their activities.)

Table 37

Lists of Regulated Hazardous Wastes

Title	Kentucky Administrative Regulations Citation
Hazardous Wastes from Specific Sources	401 KAR 31:040, Section 3
Discarded Commercial Chemical Products, Container Residues	401 KAR 31:040, Section 4
Hazardous Wastes from Nonspecific Sources	40 KAR 31:040, Section 2

Table 38

Exclusions and Special Requirements

Category	Kentucky Administrative Regulations Citation
Exclusions, e.g., domestic sewage	401 KAR 31:010, Section 4
Hazardous waste generated by small generators	401 KAR 31:010, Section 5
Hazardous waste which is used, reused, recycled, or reclaimed	401 KAR 31:010, Section 6
Hazardous waste residues in empty containers	401 KAR 31:010, Section 7

Transportation of hazardous wastes. Transportation of hazardous wastes from generator to offsite storage or treatment facility is documented by an EPA manifest. The manifest becomes the record of disposition of the hazardous wastes produced by a generator (401 KAR 32:020; 33:020). The manifest records (1) the nature and quantity of hazardous wastes, (2) transporter(s), and (3) the facility that accepted the wastes for storage and/or treatment. After acceptance by a facility operator, a copy of the completed manifest is returned to the generator and kept for 3 years.

Operation of hazardous wastes facilities. EPA regulates every aspect of the operation of a facility for treatment or storage of hazardous wastes. Prior to the operation of a facility, a permit application must be processed. The permit application contains information on the type of materials to be handled by the facility, the treatment processes to be used, and detailed emergency plans and safety precautions (401 KAR 38).

Siting and operation plans. The siting and operation of hazardous waste

facilities are regulated by the Division to protect the health of the nearby community and minimize impact on the environment. The KAR citations for different aspects of facility operation are set out in Table 39. The major requirements of the regulations are summarized in the following paragraphs.

Table 39

KAR Citations for Operation of Hazardous Waste Facilities

Siting and Operation Plans	Citation
General provisions	401 KAR 34:010
Facility standards	401 KAR 34:020
Preparedness and prevention of hazardous waste releases	401 KAR 34:030
Contingency plans and emergency procedures	401 KAR 34:040
Reports and recordkeeping	401 KAR 34:050
Ground-water protection	401 KAR 34:060

Hazardous waste facilities are to be located in areas that are safe from seismic (earthquake) activity. Facilities located within the 100-year floodplain must be safe from washouts by floodwaters or the facilities must have procedures for effective, safe removal of wastes. The facilities are to be designed to avoid or minimize adverse effects on surface- and ground-water quality and movement or migration of the disposal material through the subsurface environment (40 CFR 267.10). Monitoring of ground water is required (401 KAR 34:060). Design guidance is set out for hazardous waste landfills, impoundments, underground injection, and land disposal facilities incineration, waste piles, and tanks.

Hazardous waste facilities are required to develop a number of plans for operation of the facility. A general waste analysis is required for all shipments accepted by a hazardous waste facility. The analysis includes various physical and/or chemical analyses. A physical security plan is developed which protects the facility from unauthorized entry by man or livestock. An inspection system is set up for maintenance and safety purposes. The inspection system includes inspection of operation procedures, structural equipment, and security devices. There are to be daily inspections of areas

subject to spills. Training for all personnel for operations and emergency procedures is also required (401 KAR 34:020).

Emergency preparedness. Facilities are prepared for emergencies by acquiring adequate safety equipment and developing contingency plans. Extensive emergency equipment (e.g., firefighting) is required for all facilities. Contingency plans are developed for each facility. These plans set out procedures to be followed in case of fire, explosion, or release of hazardous wastes or hazardous waste constituents. An emergency coordinator is designated for each facility. This employee is responsible for coordination of all emergency operations, including notification of EPA and Division authorities (401 KAR 34:030).

Reports and recordkeeping. Facilities maintain the hazardous waste manifests of shipments received at the facility for a period of 3 years. In addition, a facility operating record is maintained. This includes such things as a record of each shipment received and its method of treatment, records of waste analyses, and reports of the incidents requiring implementation of the facility contingency plan (401 KAR 34:050). Biennial reports are required by EPA to summarize activities at the facility.

Pesticides

The use and disposal of pesticides is regulated under the FIFRA administered by the EPA and by regulations set out by the Division of Pesticides of the Kentucky Department of Agriculture.

Registration. Under EPA regulations, registration of a pesticide with the Regional EPA Administrator is required before a pesticide may be distributed, sold, shipped, or delivered. Pesticides distributed within Kentucky must also be registered with the Secretary of the Department of Agriculture. Basic information on the pesticide name, labeling, and directions for use is required, and the Secretary may also ask for more complete information on the chemical formula and available testing information (KRS, Title 217, Section 217.5700, 217.550). Federal container labeling requirements require information on the registrant producing the pesticide, the ingredients, directions for use, and use classification (40 CFR 162).

Use. Pesticide use is restricted by the classification (general or restricted) determined by EPA, by Kentucky law, and by permit requirements for experimental use. At the time of registration, the permitted uses are determined by the EPA (40 CFR Section 162). Kentucky law requires that pesticide

applicators, e.g., pest control companies, be certified in application of restricted use pesticides (302 KAR 31:015, Sections 1-6, 8). The Department holds regular training sessions, and applicants must demonstrate a level of competence for pesticide application and safety for certification. Permits are required for the experimental use of unregistered pesticides or for a previously unapproved use of a registered pesticide (KRS, Title 217, Section 217.574).

Storage and disposal. Pesticides must be stored and disposed in a manner so as not to cause injury to humans, wildlife, or the environment (KRS, Title 217B, Sec. 217B.1190(1)).

Solid waste disposal

Permits for solid waste disposal facilities are administered by the Division of Waste Management in the Department for Environmental Protection, Natural Resources and Environmental Protection Cabinet.

Planning and construction. Prior to construction of a new solid waste disposal system, the Division must approve plans for the facility. Insignificant amounts of some industrial wastes are disposed of under a permit by rule. For landfill facilities, design and construction plans are submitted to the Division for approval (KAR, Chapter 47, 47:020 and 47:060).

The Division has established design and operation criteria for landfills. Specific criteria have been set for landfills used for residential, industrial, and specialized wastes (401 KAR 47:040, Subsections 1-3). General design criteria include:

a. Sufficient equipment is available.

b. Adequate cover material is available to prevent fire hazards, unsightly appearance, disease vectors, and for interim and final cover.

c. Special handling problems are accommodated.

d. A 100-ft (30.5-m) minimum buffer zone is established between the fill area and property line.

e. Locations conform to local zoning laws.

f. Surface contours of fill areas will minimize surface water running onto or through fill areas.

g. The bottom of the waste in the landfills shall be at least 2 ft (0.6 m) above bedrock, sand, or gravel.

h. Landfills subject to a high seasonal water table will be restricted to sites which provide greater than 2 ft (0.6 m) of compacted earth

and the maximum water table and include measures to prevent contamination of ground water.

i. Landfills in the 100-year floodplain are to be operated and designed to prevent washout of wastes and not restrict the flow of the 100-year flood.

In addition to the general criteria, the Division evaluates construction and design permits on the basis of the landfill type, e.g., residential, which may specify more stringent design criteria. After construction, the facility is inspected and an operations permit is issued. After operation has commenced, significant modifications to the facilities require submission of new construction permits.

Noise

The Natural Resources and Environmental Protection Cabinet has authority to adopt regulations and develop plans for control of environmental noise (as opposed to workplace or occupational noise) under the State Noise Control Act. EPA regulations provide the standards for transportation noise.

References

Introduction

Erickson, Paul A. 1979. Environmental Impact Assessment, Principles and Applications, Academic Press, New York.

Jain, Ravinder K., Urban, Loyd, and Stacey, Gary S. 1981. Environmental Impact Analysis, 2d ed., Van Nostrand Reinhold, New York.

Mississippi

Bureau of Pollution Control. 1984a. "State of Mississippi 1984 Water Quality Report to Congress," Mississippi Department of Natural Resources, Jackson, Miss.

_____. 1984b. "Ambient Air Quality Summary, Calendar Year 1983," Mississippi Department of Natural Resources, Jackson, Miss.

Alabama

Alabama Air Pollution Control Commission. 1980. "Rules and Regulations," Montgomery, Ala.

Alabama Water Improvement Commission. 1979. "National Pollutant Discharge Elimination System Regulations," Montgomery, Ala.

_____. 1982a. "Water Quality Report to Congress for Calendar Years 1980 and 1981," Montgomery, Ala.

_____. 1982b. "Regulations, Policies, and Procedures," Title I, Chaps. 5 and 6; Title II, Montgomery Ala.

Tennessee

Speer, R. D., and Bulanowski, G. A. 1984. "Speer's Digest of Toxic Substances State Law: 1983-84 Trends, Summaries, and Forecasts," Strategic Assessments, Inc., Boulder, Colo.

Tennessee Air Pollution Control Board. 1984. "Construction Permitting Guidelines for Air Polluting Sources in the State of Tennessee" (draft), Nashville, Tenn.

Tennessee Department of Public Health, Division of Water Quality Control. 1978. "Water Quality Management Plan for the Tennessee River-Western Valley Basin," Nashville, Tenn.

_____. 1982. "The Tennessee 305(b) Report, Water Quality Inventory 1980-1982," Nashville, Tenn.

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